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THE GERMAN ANTARCTIC EXPEDITION.*

By Dr. ERICH VON DRYGALSKI.

The German South Polar Expedition, on which I have now to address you, has been absent altogether twenty-eight months, of which fourteen months were passed in the south polar ice, ten months with our operations in the South Atlantic and South Indian oceans, and four months with our work and residence in the islands of the Indian and Atlantic oceans and at the Cape. Our labours were at once begun on reaching the equator, and thereby were carried out, not only our own plans, but also the expressed wishes of all the scientific circles in Germany. We had not only to make ourselves familiar under easier conditions with our search appliances, with the *Gauss* and its arrangements, but, above all, to face from the first certain problems which awaited our subsequent operations in the south polar region. When I venture to recall the fact that in the glowing heat of the tropics, at temperatures of 30° C. at the surface, icy cold water already prevails at depths of 800 to 900 metres—a phenomenon referred to in theory to south polar influences—it will not appear unreasonable to suppose that the study of these conditions must have some interest for an expedition bound for the Antarctic Region, their presumable source, not to mention the question of the fauna living in these different marine waters. And so with other matters, as, for instance, the question of terrestrial magnetism.

But above all we had to make ourselves acquainted with the ship and her equipment. Amongst the good points of the *Gauss* was her thorough seaworthiness, which she had maintained despite her rounded forms, and later gave proof of under the exceptionally heavy stress of the "rolling forties." Amongst her drawbacks was a certain lack of speed,

* Read at the Royal Geographical Society, April 25, 1904. Map, p. 248.

which made the voyage to Cape Town longer than I had calculated. For this, however, the ship was not to blame, since she had been built stout enough to resist the ice, and exceptionally broad in order to lie steadily in heavy seas, and was, moreover, heavily laden and equipped with large deck-structures, which presented unwelcome surfaces to the play of the wind, and made the steering more difficult. With all this the *Gauss* could scarcely be a swift sailer; nor was she built for this purpose. The estimated speed of 7 knots was maintained only in still water or in calms amid the doldrums; but to advance at this speed on the constantly rolling surface of the ocean there were needed strong gales. As in the tropics we had remarkably light trade winds and frequent calms, we made slow headway. The time was, however, turned to good account for our operations on the ocean. Still, our arrival at the Cape was thereby delayed quite a month, although this circumstance turned out to be a matter of indifference, or rather actually advantageous for our later progress southwards.

In Cape Town, towards the end of November and beginning of December, 1901, we again compared our instruments with those of a fixed observatory, the excellent observatory of Cape Colony, just as, shortly before our arrival, had been done by the British Antarctic Expedition on board the *Discovery*. We also completed our vessel's equipment in some few details, and enjoyed the hearty welcome accorded to us by all circles in Cape Colony.

It would be scarcely possible to imagine a sharper contrast than that which we experienced on our departure from Cape Town on December 7, 1901. In five days, after crossing the warm Cape Agulhas stream, we plunged into the cold currents which are already connected with the frozen ocean, and in a few hours passed from the smooth waters of the harbour and its neighbourhood into the ceaselessly storm-tossed sea surrounding the antarctic circle.

Our next undertaking was the study of this sea, where prevail the everlasting west winds which encircle the globe between the extremities of the continents and the south polar ice—a sea dreaded for its mighty billows, for its constantly overcast skies and fierce gales. Round our vessel hovered the various species of albatrosses, Cape pigeons, blue petrels, œstrellata, majaquæus, and other southern storm birds, which thus presented a strong contrast to the lifeless calms of the tropical seas. This austral ocean is for the most part traversed only along its northern edge, although the shortest routes between Africa, South America, and Australia lie more to the south. Its navigation is so far easy enough, having to do almost exclusively with westerly winds alone, hence is nearly altogether confined to the course from west to east, the opposite direction against the dominant winds and currents presenting great obstacles even to powerful steamers, while there is, as a rule, no question of more northerly or southerly routes.

In this sea we successfully carried out a series of soundings and investigations between Cape Town and Kerguelen, and further on as far as the fringe of ice. Amongst the results, I lay stress on the demonstration of a trough over 4500 metres deep, running between the Crozet islands and Kerguelen, and connecting the abysses of the Indian ocean with a deep ravine on the outer edge of the austral glacial sea.

It was by no means easy to operate in this region, where the deck was almost constantly swept by huge waves. Most difficult, perhaps, was it to continue the terrestrial magnetic work, as for this purpose a fixed position of the freely balanced magnetic needle is needed to read off the scale. This is naturally a difficult task while the ship is heavily

SURFACE OF INLAND ICE, SHOWING UNDULATION OF LAND SURFACE.

rolling and pitching and the needle answering with still more violent vibrations. Nevertheless here also we managed, through the energetic labours of Dr. Bidlingmaier, to record complete and serviceable observations along a somewhat extensive curve or loop, which in the form of a horizontal 8 traverses the South Indian ocean and the glacial sea.

During these researches between Cape Town and the fringe of ice our outward voyage was broken by three visits, first to Possession island of the Crozet group, and then to Kerguelen and then to Heard island of the Macdonald group. On Kerguelen we tarried one month, and a day each on the other two islands.

All three groups are uninhabited. Lying in the zone of the

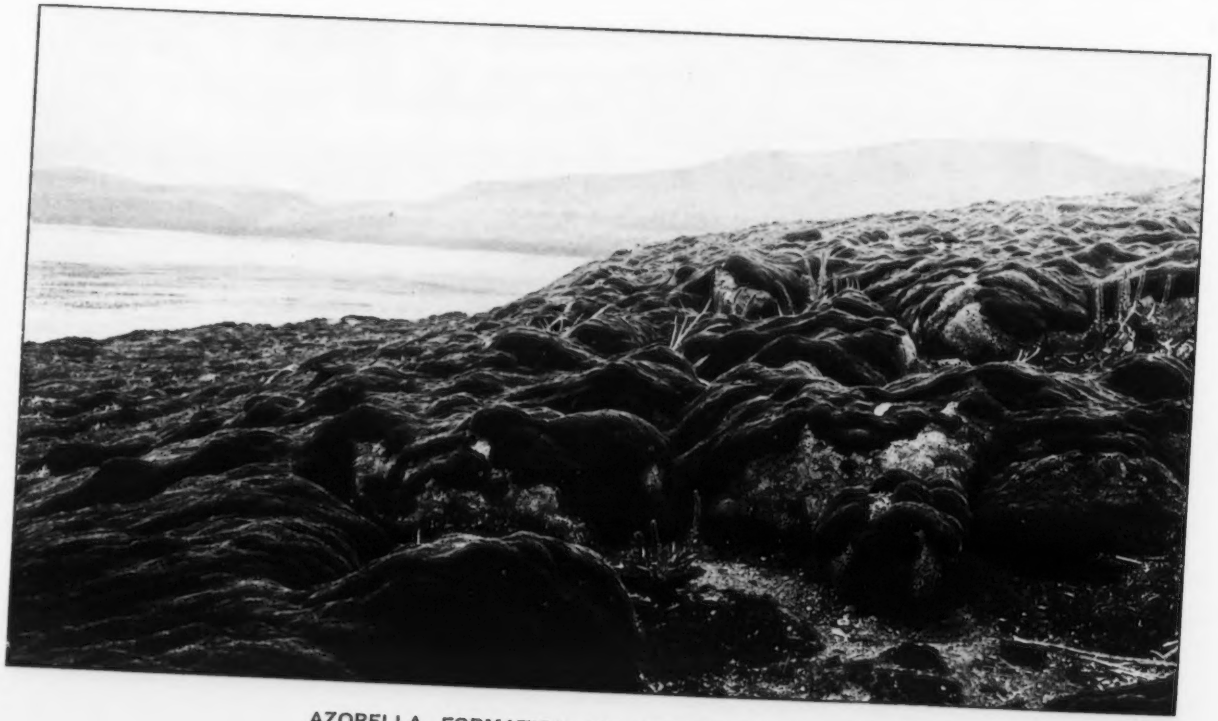
perennial west winds, they are continually buffeted by storms accompanied by snow and rain; hence with their cold damp climate they offer no attractive places for settlement. At Kerguelen we had snowy weather in January, that is, the midsummer of those parts, and that in a latitude corresponding in the northern hemisphere to that of South Germany. Throughout the year the temperature is equable, and oscillates relatively little round the freezing-point. Here trees do not thrive. The land is rocky, or in the depressions swampy, like a sponge supersaturated by the frequent downpours. All three groups are igneous, partly of still quite recent volcanic origin, as was plainly evident. On Kerguelen and Heard the glacier development is considerable, and was more so in former times.

On these insular groups the animal and plant world retains its full primeval charm. In Kerguelen alone it presented a marked change, for here some thirty years ago the *Challenger* Expedition let loose a few rabbits, which have increased to a remarkable extent, and come hopping round strangers landing on the coast. They have seriously reduced the indigenous flora, having especially almost completely extirpated the edible Kerguelen cabbage, which now grows only on isolated islands and inaccessible cliffs which the rabbits do not frequent.

In Kerguelen we stayed a month, in order there to establish a branch station to make terrestrial magnetic and meteorological observations while we remained in the Antarctic waters, and also in order to ship fresh supplies.

Here the steamer *Tanglin* had gone ahead with Herr Enzensperger, Dr. Luyken, and the sailor Wienke. When we met them on January 2, 1902, in Observatory bay, we found everything already almost completely installed, and the station beginning its operations. The members were all in the best of health.

But when, on the return voyage, we reached Cape Town on June 9, 1903, we learnt that Herr Enzensperger had died, and that Dr. Werth was slowly recovering from a severe illness in Sydney. A frightful calamity had overtaken the station, a calamity appalling in the solitude, in the impossibility even to foresee and prepare for it, hence especially terrible in the relentless fury with which it fell upon its victims. About six months after our departure, and nearly eight months after the return of the steamer *Tanglin* from Kerguelen, Dr. Werth, who had sailed with the *Gauss*, fell ill of the Chinese malady beriberi, from which the crew of the *Tanglin* had suffered, although he had not again come in contact with them, and two months later Herr Enzensperger was also attacked. His strong constitution had struggled vigorously against the terrible disease, while all the time fulfilling his duties with unwearied loyalty to the last. He now rests far from his South German home on the very spot to which were devoted his last trusty labours, his hopes, and his great projects. With the profound

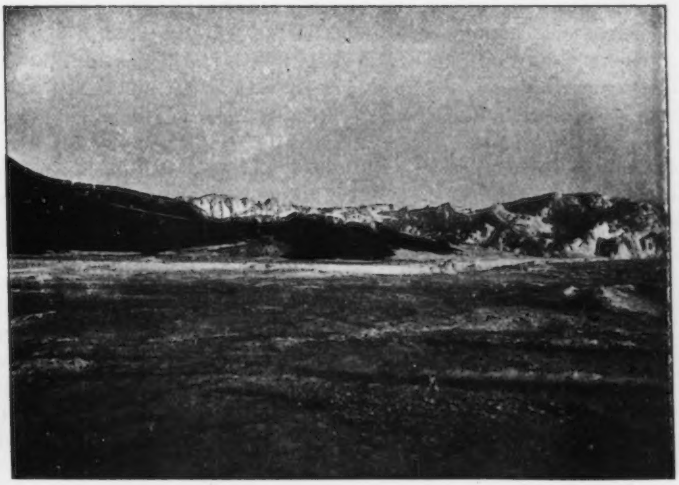


AZORELLA FORMATION ON KERGUELEN ISLAND.

grief for his death is mingled a sense of wonder at what was withal achieved in Kerguelen, and will remain the fairest monument of our departed associate.

On January 31, 1902, we left Kerguelen, and on February 3 Heard island, after the already-mentioned short visit. Now the great unknown lay before us, and here we had to seek out the right course, which, in the almost complete lack of previous experiences, was practically a question of pure luck.

I may here mention how the *division of labour* was carried out among the several nations which were at the time engaged with the exploration of the Antarctic region.



INLAND ICE AND MORAINE AROUND GAUSSBERG.

England aspired to build on the foundations which had been laid by James Clark Ross in the years 1841 and 1842, and thus complete our knowledge of the Ross sea, that great portal of the south polar domain which Ross had discovered and navigated beyond 78° S. We already know with what brilliant success the English Expedition under Captain Scott has fulfilled its mission; it is a pleasure to me to be able here to congratulate the English people and the Royal Geographical Society on this great achievement, and to express my satisfaction that the expedition in the *Discovery* has been so fortunate as to get out of the ice and to make its return journey successfully.

To the *Swedish Expedition*, under the guiding hand of Otto Nordenskiöld, was assigned the insular region south-east of America. The

Scottish Expedition, under W. M. Bruce, which set out in 1902, that is, a year later, undertook the exploration of the Weddell sea, in which, in 1823, Captain Weddell had penetrated with two ships beyond 74° S., whereas his successors, amongst them Dumont d'Urville, Wilkes, and J. C. Ross, as well as Bruce himself, according to the latest news, were all prevented by the ice from getting so far south. The Argentine Republic has established a meteorological-magnetic station of the first order in Staten island.

The *German Expedition* had at the time the choice between the regions bordering on the Indian ocean south of Kerguelen and the Weddell sea, which forms a southern prolongation of the Atlantic ocean. Both regions were supported by weighty votes, and if I decided for the first, and accordingly chose the Kerguelen route, it was on geographical grounds which to me seemed conclusive. For south of Kerguelen, between 60° and 100° E. of Greenwich, there lay before us an Antarctic region where hitherto no serious advance had been attempted, and where were consequently concealed many debatable problems. Here the voyages of Cook, Bellingshausen, Biscoe, and Kemp failed to reach 63° S.; Moore got a little beyond 64° S.; and the *Challenger* alone succeeded in passing the Antarctic circle, but then, to avoid being closed in, returned without sighting land.

Now, the relatively low degrees of latitude here reached might, as I said to myself, have been due to the fact that progress in this quarter was specially difficult, owing possibly to some unknown seaboard projecting far to the north and moreover encompassed by a broad zone of pack-ice. It might, however, be also due to the pioneer ships, since vessels under sail or not properly equipped for glacial navigation had alone made those first serious but premature essays. In point of fact, nothing was yet known about the trend of the coast; land had not yet been anywhere sighted in that direction.

The complete uncertainty prevailing about that region between 60° and 100° E. is best shown by the two diametrically opposite views still current regarding its conformation. Thus one of these views assumed a seaboard which about the latitude of the polar circle forms a connection between the foreland sighted by the American Wilkes in the east, that is to say, Knox Land, and the Kemp's and Enderby lands lying more to the west.

The other view, which is substantially that advocated by Privy Councillor Von Neumayer, questions the validity of Wilkes's arguments for the existence of a coast between Knox Land and Kemp's Land; on the contrary, here he conjectures a sea stretching away to the south, and kept open by a stream which sets from Kerguelen southwards, and perhaps here crosses high southern latitudes and merges in the Weddell sea.

When I selected the Kerguelen route, I was of course aware of these

views. Hence, like the *Fram* expedition in the north, I calculated both on the possibility of being caught up by a drift and thus carried over high southern latitudes to the Weddell sea, as well as on the other possibility of soon striking land. From the scientific standpoint, it was naturally a matter of indifference whatever the issue might be. In the first case, a drift like that of the Fram perhaps tempted us with a dazzling superficial result and recognition on the part of those who measure the value of a polar expedition only by the degrees of latitude. In the second case—the discovery of land—we were attracted by an intense desire to penetrate into the physics of the Antarctic region in a way that could not be attained by a drift.

GAUSSBERG FROM THE NORTH-EAST.

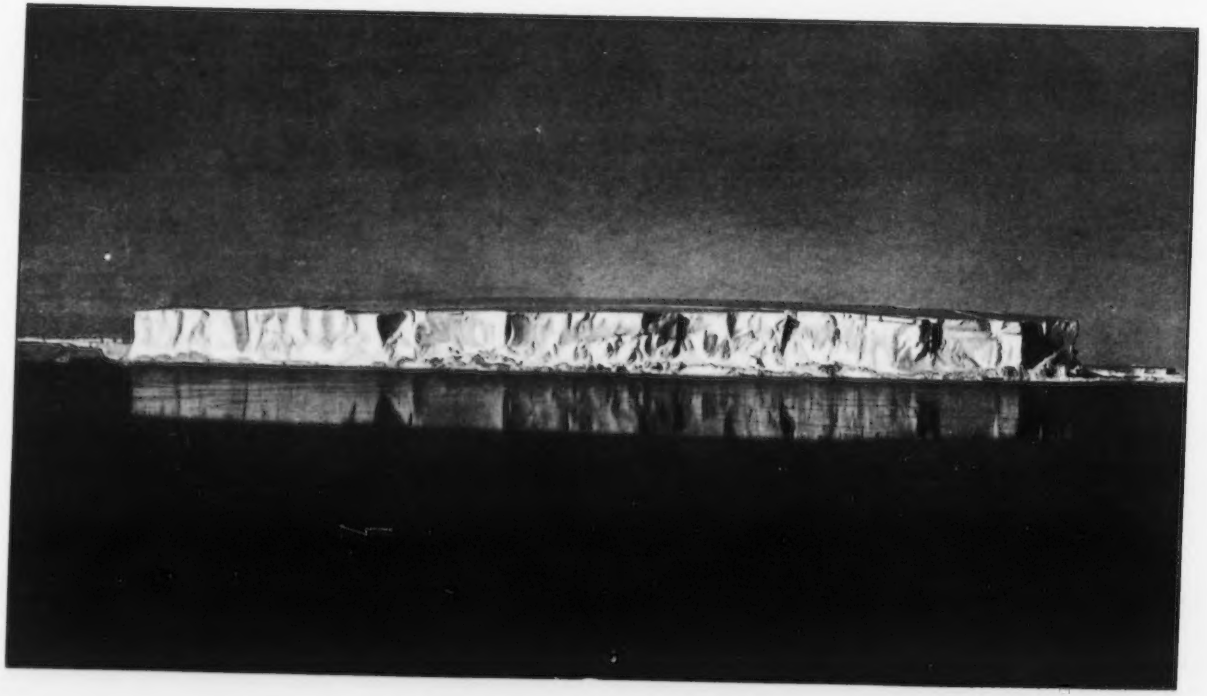
As you know, the decision resulted in favour of the latter view. We found a seaboard trending east and west just a little south of the Antarctic circle, and consequently forming a bar to further progress southwards. For a portion of the unknown space between Knox Land and Kemp's Land—a stretch of over 600 miles—a land connection is now definitely established. We should have gladly obtained direct evidence for the remaining section also. But for this time was wanting, and my request for permission again to sail from Cape Town southwards and thus continue our investigations failed to meet with the approval of the Government. But how far our observations may by indirect inference shed further light on the trend of the coast farther west I cannot decide until our worked-up material is available.

The navigation in the section of the glacial sea visited by us may be described in a few words. Our course was determined by the land projecting far north up to the latitude of the Antarctic circle. Before this land are yearly formed in a fixed position vast marine ice-fields, which even in summer do not thaw, the summer heat being insufficient for the purpose. But every year some of the ice-fields break away, and then drift with the currents in vast irregular processions away to the north. Hence the prevailing currents have a trend from south to north, and not from north to south as is supposed. Now, it is extremely difficult, almost impossible, to attempt to sail through this drift-ice parallel with the coast, that is, in an east-to-west direction. In doing so one gets blocked again and again, is caught up with the ice by the currents, and is borne northwards away to the open seas. But it is quite possible to sail between two such drifts from north to south or from south to north, and of such routes there are many. Their position depends on the winds; but one may always calculate on finding such routes, and thus reach the southern seaboard.

After two fruitless attempts, which brought us nothing but evidence of the non-existence of Termination Land, we discovered one of these routes, and from February 18, 1902, pushed southwards with relatively little trouble. Then came obstructions; the icebergs increased, and these together with the floes threatened to block the way. Still, these difficulties were overcome, and, strange to say, the swell soon again came from the south, and presently we had before us the wide open surface where they took their rise. Here was a vast free expanse, apparently a boundless open waterway leading southwards; we were elated with the hope that we had at last discovered a free route to high southern latitudes, perhaps a course west of and analogous to the Ross sea, a second hitherto unknown portal to the polar regions. Then, on February 19, the plummet unexpectedly touched ground in a depth of 240 metres, after we had shortly before recorded soundings of 3000 metres and upwards. A snowstorm was blowing, and we could see nothing. Still, the sea was shallow; the wind betrayed symptoms of a "föhn," hence must be coming from *terra firma*, while the *plankton* also indicated proximity to land. There could no longer be any doubt that we were off some coast, though we could not see where.

All was excitement the next day, when we drove in a fierce snowstorm between icebergs, though otherwise in the open sea. During the night on February 21 the weather improved, and when the short night yielded to day there lay the land—a new land—before our eyes.

Whatever feelings may have agitated us at this sight—whether grief that a stop was so soon put to our ambition to advance farther south, or joy at the actual result, the happy solution of a great geographical question—one thing is certain, that for the moment all other



TYPICAL ANTARCTIC ICEBERG.

feelings gave way before the imposing view of land. There it lay in its quiet solitary grandeur, never before beheld, never before set foot on. All was ice-clad; still, that it was land was shown beyond all doubt by the very forms affected by the ice. For, looking towards the coast, we could see the uniform surfaces which sloped down from the south in broad smooth undulations, branching off and developing glaciers, such as are conditioned by the forms of a firm substratum. The coast itself was a high vertical wall of ice, too steep to be approached in whatever direction we turned our eyes, only somewhat diversified high up and with an approximate east-to-west trend—in fact, such another

CAMP ON THE ICE.

ice-cliff as in his time confronted Ross on the southern margin of his Ross sea.

A landing on this icy barrier was out of the question. Hence we resumed such operations as, in the absence of ice-free tracts, might lead to some conclusions regarding the substratum of the ice-cap—that is, the character of the land itself. We accordingly took soundings, fished with the drag-net, and made magnetic observations. Then we continued our course in the direction of the west, since from the spot where we had struck land, and from what we had already seen of its nature, we had drawn a sufficiently accurate inference regarding the section of Wilkes Land which lay east of us. Hence we had now to follow the coast westwards in the direction of Kemp's Land, in order

to see in what way was filled in the unknown gap between Knox and Kemp's Lands.

In the year 1902 our voyage could not be continued much longer, and our freedom of action was already reckoned only by the hour. By midday of February 21 we were already fain to take a northerly bend, as dense chains of icebergs barred our way westwards. These we skirted, ever on the look-out for a break through which to pierce them. Small openings also presented themselves, but caution was incumbent on us, for the icebergs gave the impression of being of great age, as if they had long been in this position, and as if, as far as one could foresee, they might still remain for an indefinite time in the same position together with the vessel penetrating into them. At last was seen a wider gap, presenting a waterway to the west, and I did not hesitate to utilize it. We therefore resumed our westerly course between an old group of icebergs, which were apparently still fixed on the south, and a troop of icebergs, possibly already floating away on the north side.

Meanwhile it was nightfall, and easterly winds had sprung up, which rapidly increased in strength. With them we forged swiftly ahead, and presently found ourselves completely surrounded by the ice, and even at some distance ahead everything seemed again to close in. The darkness was unfavourable for pursuing this course, for we could no longer see whither we were tending. The wind also was growing to a blizzard; everything round about was driving rapidly ahead, and we unwillingly in its company. Then I decided to keep to the one safe thing here available, that is, the open sea off the land where we had been in the morning, in order thus still to preserve our freedom of action. I accordingly gave the command to return south-eastwards in the direction of this sea.

It could no longer be reached. With the still waxing fierce snow-storm the ice drove down upon us from the east. Confused groups of floes rush swiftly through snow and fog, through which the eye can no longer clearly penetrate, as they seem now grown to hills and continuous ridges, and amongst them real icebergs which the ship had to avoid. Thus was the course constantly changed, with frequent collisions and pressure from the floes, and then at last, towards four o'clock in the morning of February 22, 1902, a long protracted grinding sound, which gradually ceased; the storm continued, but we lay fast and presently almost at rest—*the rest of a twelvemonth.*

On expeditions like ours, crises such as we had just experienced seldom present themselves at once to the mind quite clearly with all their far-reaching consequences, and if they do, it is still but for a moment. Every instant has its appointed task demanding immediate performance, and thus diverting attention from thoughts about the future. But if we later look back and weigh the *pros* and *cons* of the

actual results, I must now say with full conviction that the final issue, brought about by the fierce snowstorm during the night of February 22, 1902, was on the whole fortunate.

Here we now lay on the spot which was to be our winter station in a shoal from 300 to 400 metres deep, which was, moreover, encompassed by many other even shallower banks. These banks are traversed by the huge icebergs which break loose from the edge of the inland ice, not floating away, but stranding on them, and thus remaining long in the same position. These iceberg shoals also so firmly arrest the floes, which are driven against them by the prevailing east winds, that operations may be conducted on them as on *terra firma*. On the

THE "GAUSS" BURIED IN SNOW, FROM WEST SIDE.

floes surrounding us we were able to carry out even the most delicate observations without disturbances of the level, and of such splendid sites for stations there are many, as the configuration of the coast remains the same for long stretches. The only drawback is that they may become even much more stable than one thinks or wishes, since a break-up cannot be depended upon in every summer season. But away to the north of these iceberg shoals, where the deep sea begins, such sites for stations are no longer met, for there even in winter the ice is perpetually moving and drifting. Had we succeeded in sailing round the north end of the shoal on the night when we stuck fast, as we did the next year, we should have been caught up by the floating ice and the northerly currents prevailing in it, and in about two months

should have again found ourselves in the open sea. But in that case there would have been no possibility of getting back to found a station.

From this it follows that it would have been useless for us to have attempted to press forward through the ice at an earlier time of year. For even supposing that in this we had succeeded as well as in February, and supposing, further, that we might not have been held fast so early as in February, we should still have had again to trust to the driving floes on the edge of the still waters in order to make headway, and therein there was only a slow drift and a still slower course northwards. If there was any at all, we should have seen but little more of the coast than we did the following year, and at the same time must have left our good winter station quite a moot question, and might possibly not have been able to winter at all.

As it happened, we established our winter station on these floes. They were 5 to 6 metres thick, large and angular, with raised edges, and showed by their forms that they had only been for a short period on the move during the year. On them we were able to erect firm observations; but not all of them were equally suited for this purpose, for during the course of the winter they became so heavily laden with snow that they sank below the surface, so that the appliances installed on them had to be removed. In due course we learnt to recognize that this snowy element was the chief factor in the formation and structure of the floe-ice, while the snowstorms were the mightiest force dominant in the south polar region.

At times announced by clouds from the east, which with small beginnings rapidly overcast the whole sky; at times also suddenly filling the air with powdered snow, and mostly accompanied by an increase of temperature; always with abundant snow, whether it falls simultaneously or is only driven forward by them—thus begin these blizzards, which rapidly acquire a terrific impetus.

Try ever so often, it is quite useless to contend with them. At but a few metres' distance nothing could be seen from the ship, so that on one occasion a sailor enveloped in a snowstorm in the immediate vicinity of the ship was lost for hours, until the whole crew lashed together went in search and fortunately found him. On a sleighing excursion which I had headed, I suddenly lost sight of the sleigh, although it was close behind me. When I stopped, the dogs ran up. With much toil we gained the tent, shoved the sleigh in to support and steady it, and then lay a day and a night, and yet another day and night, without the possibility of leaving the tent, eight of us in the narrowest space, where for forty-eight hours all natural functions had to be performed. Outside the storm raged and rattled against our tent, which from within we propped up and held fast. Then it began slowly to bury itself in the snow, and through every rift the snowy blasts made their way in and

over our sleeping-sacks, so that when, after long waiting, the weather grew better, it took us hours of hard work to dig out the tent.

Almost worse were the effects of the blizzards on the ship. Once we had all to turn out to rescue the dogs, which were chained up and getting smothered in the snow, as their doleful howlings told us just in time. The gusts swept over the observatories, so that the floes sank under the tremendous impact. Then the observatories got flooded with water, which, with the steady subsidence of the floes, penetrated from below; nor was it always possible to save the instruments, so sudden were the squalls. The ship itself felt the shocks, and under the fearful strain constantly heaved over. In the first of those gales, before we

WEDDELL SEAL.

were prepared for them, doors and windows and all the hatches were shattered, and everything inside was as if buried in a huge grave. It cost us great efforts to recover ourselves and again to clear the vessel, an operation which had to be repeated again and again. For such storms were far from rare. With but short intervals, they raged throughout nearly the whole of May and August. In June and July it was a little better, though many such storms visited us in April and again in September. Even in midsummer they did not spare us, and one of the fiercest burst upon us in January. Their worst feature was their duration. For although in summer they lasted only a day or two, in winter we might have to endure them for from three to five days,

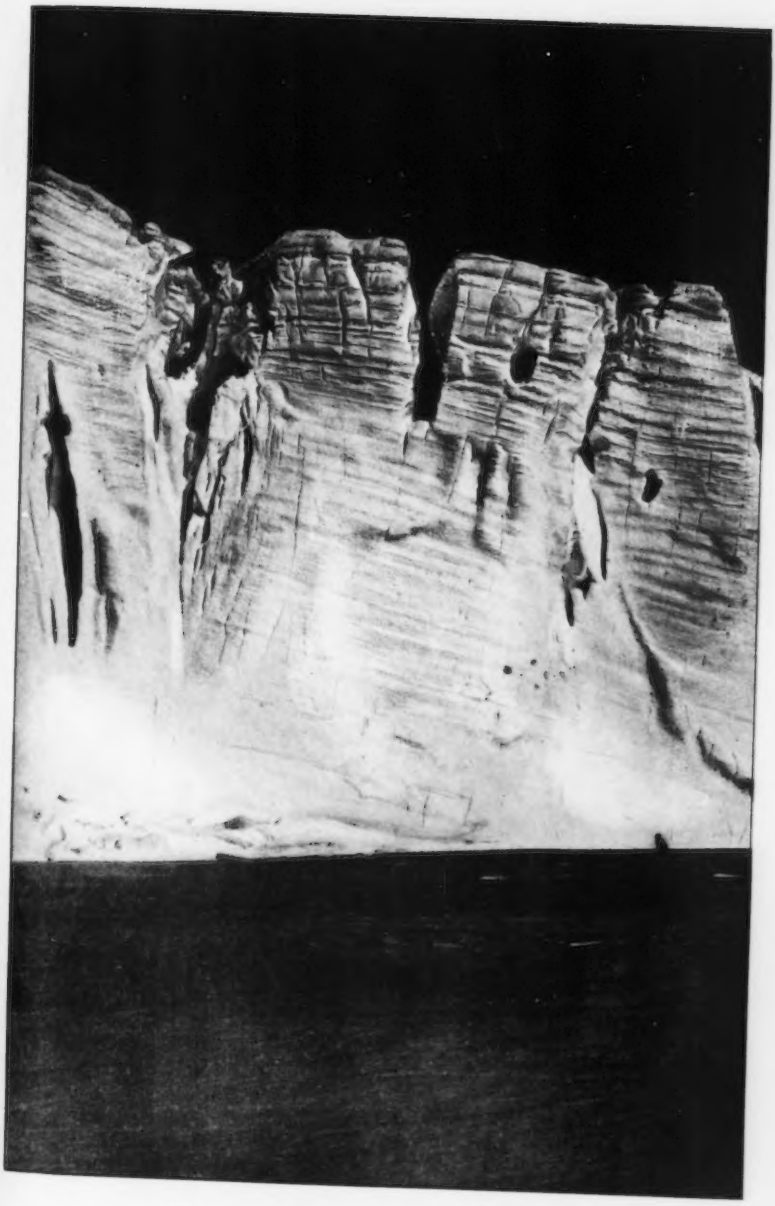
seeking in the ship or the tent such shelter as they could afford. Our daily visits to the observatories were of course uninterrupted, being made by means of cables, which extended to them from the ship and enabled us to pass to and fro.

During the installation of the station in March, 1902, we started our sleighing excursions, and kept them up till far into the winter, that is, till the middle of May, and then resumed them in September, continuing them well into December. That we selected the worst seasons of the year for these sleighing trips, suspending them in midsummer, was conditioned by the position of our station. We were not moored to the land, where one might remain as long as he liked, but closed in by floe-ice, which we might expect and hope would break up in the summer. But then the ship would have necessarily to leave its station without our being able to conjecture when and whither, as, in fact, it turned out at last. Besides this, in midsummer, all travelling on the marine icefields was extremely difficult. Through the action of the solar rays, combined with that of the marine waters surging up from below, the floes became so thoroughly decomposed that even in December one sank at every step up to the waist and even higher, so that whatever progress could be made at that time with laden sleighs over the ice stood in no kind of relation to the toil and labour spent on it. In this respect the relations were essentially different on the land ice, where is lacking the strongly decomposing action of the marine water intruding from below.

And, in fact, the ice looked as if it might break up at an early date. Throughout the whole winter we had noticed the ice constantly floating and drifting at a distance of from 6 to 10 miles to the north and within less than 4 miles east of the station. On September 16, 1902, the day before our starting on a month's sleighing excursion, the great pack which we had observed nearly 4 miles to the east began suddenly and without any very perceptible reason to drift away to the north, and on the same day 600 metres to the west of the ship a fissure opened where the very pack in which we lay began to break up. Under these circumstances, we could no longer have any great confidence in the stability of the position then occupied by us.

The difficulties of the sleighing excursions in the colder seasons of the year were not light. Specially hard work was the long observation of the instruments while taking measuring records on the inland ice, since here we had still to face both a temperature of from 20° to 30° C. below freezing-point and persistent high winds. Easier was the forward motion with the sleighs, although even here great physical efforts were needed.

The sleighing journeys, which occupied us altogether five months, had for their objective the seaboard, the ice-free *Gaussberg*, which we there discovered, and long scientific operations in its vicinity. It would



STRATIFICATION OF THE INLAND ICE.

doubtless have been possible to push from the *Gaussberg* over the inland ice southwards. In any case, it was easier than the long stretch of 46 miles from our winter station to the *Gaussberg*. But little was to be expected from such a journey. It was improbable, if not hopeless to expect, that we should again come upon ice-free land in the direction of the south. This we could infer, not only from the extensive prospects commanded by the *Gaussberg* and by the captive balloon, but also from the whole aspect of the inland ice, which suggested the notion of boundless space and monotony. The same conclusion was above all indicated by the winds, which blew from the inland ice, and by their Föhn properties pointed at a far-reaching, uniformly ice-capped hinterland.

MORAINE ON THE EAST SIDE OF GAUSSBERG.

Thus we had nothing to expect from the interior beyond a long journey over uniform undulating ice, such as we had already seen on the coast, without, however, being able to arrange for serious observations.

During our sleighing trips records were taken of the phenomena of motion presented by the inland ice; the characters of a real littoral fauna in the south polar region were compared with those in the *Gauss* found in the smooth waters; so also the climatic phenomena immediately on the coast with those further out on the open sea. Efforts were made to ascertain whether the oscillations of the terrestrial magnetic forces close to *terra firma* differed from those at depths of over 400 metres, as they had been for the first time studied from this point of view at our winter station. Stones were collected; lichens and mosses were also

found; the nesting-places discovered of one of the two species of stormy petrels in the Austral glacial sea; perhaps, also, information was obtained of a south polar insect. In a word, many interesting facts were brought to light, amply rewarding the great expenditure of five months' time and efforts on these sleighing excursions.

With our daily work and occupations about the station, the winter passed quickly enough; the early spring even quicker with its sleighing excursions. Then came summer with its long days, its abundant light, and occasionally also a little welcome warmth. On ten days of the year the atmospheric temperature rose for a short time above the freezing-point. But where the sun shone it was even oppressively warm; eyes and skin suffered from the fulness of the light, and required continuous protection. Those who neglected such shelter had to seek medical treatment for snow-blindness or for blisters on the face, and especially on the lips.

December was the warmest month. In January it was already colder, and the pools on the glacial surfaces were again frozen over. Thus January was the month of expectation for our release, which most of us already began to despair of, owing to the steady falling off of all indications of summer. Now, also, we were busy with the new plans for the contingency of our release being deferred. Amongst these preparations was a rough rubble track which we had laid down for over a mile across the ice to the position of the *Gauss* in a line with her bow, the object being to hasten the melting of the ice by the dark rubble and its greater absorption of heat in the sun. Other expedients were blasting operations (which, however, had no great results, thanks to the immense thickness of the ice), and also the release of the *Gauss* from its winter quarters by means of ice saws 6 metres long.

All these efforts, however, could but confirm the impression that everything we might contribute to our release was as nothing to what had really to be done. If we were to be liberated, nature herself would have to re-open the gates which she had closed. The rubble track alone had actually melted to a broad waterway, although even this was at most but 2 metres deep, whereas the ice to be broken up had an average thickness of from 5 to 6 metres, and our waterway was again frozen over in January.

But suddenly, on January 30, 1903, the whole situation was materially changed, for the icebergs which had closely encompassed us now began to drift away northwards. Three days later they were followed by the pack-ice in which we lay, without, however, breaking up, and as it was 2½ miles long and over a mile wide, it was unable to get through the barrier of still immovable icebergs. With it we drifted to and fro round about the place where we had wintered. Then suddenly, on February 8, came our deliverance. On the morning of

that day we noticed a movement in the sea amid the floe-ice; this movement increased during the day, and here the ice suddenly broke in two at 3.15 in the afternoon. The cleavage took place along the line where we had laid down the rough track, and on which the ice had thus been weakened. Now all was free; the boilers had for days been heated with penguins; all articles lying about on the ice were rapidly got on board; after a three hours' struggle the fissures were wide enough for the *Gauss*, and about 7 o'clock in the evening we were able, with three hearty cheers, to leave the site of our winter quarters.

Meanwhile an east wind had sprung up, like that which a year before had held us fast to the same place, and, as on that occasion, in the course of the evening it developed to a snowstorm, which again immediately closed the newly formed rifts where we had just found deliverance.

On the further vicissitudes of the expedition a few words will suffice. For exactly two months, to April 8, 1903, our struggle with the ice was maintained. My plan was to continue our westerly course as long as possible in the later season of the year, and then seek out a new winter station, in order to pass a second winter in another locality, and in the following spring extend our route still further along the coast. Now, however, it fell out as I had anticipated from the character of the navigation. North of the iceberg shoals in deep water we were again and again closed in by the ice drifting in the direction from south to north, and thus carried northwards to the open sea, where we for the first time again found ourselves on March 16, 1903. Although the season was already far advanced, I still wanted to make a new attempt. We therefore directed our course at first along the outer edge of the floe-ice, and then seized the first oppportunity to again push south, in order, if possible, again to reach the coast, and there pass the winter in a new district. At first fortune favoured us, and about 10° west of our previous winter station we once more reached 65°·5 S. lat. But here the new ice proved so thick that we were no longer able to break through it, and therefore did not again reach the coast. On the other hand, the condition of this ice was nowhere firm enough to afford a site for a winter station. What we had unwillingly obtained from the snowstorm the previous year now baffled all our efforts. We wanted to get blocked at various points in the ice; but everything was again broken up by the next storm, which bore us with the current northwards to the open sea. In this respect our experiences differed essentially from those of earlier expeditions. For these earlier expeditions no longer entered the ice at such a late season of the year, fearing to get ice-bound for the winter, whereas we entered it for this very purpose, but failed in our object, because we again and again drifted away to the north.

After repeated essays extending over two months, it became evident

that we should neither find a suitable winter station, since, owing to the young ice, we could no longer push forward to the still and shallow waters off the coast, nor yet be able, on the other hand, to extend the coast voyage any further, since the young ice was already too strong, while the period of work was too short owing to the increasing darkness. I therefore decided to leave the ice, and this took place on April 9, 1903, after another storm had once more deprived us of any halting-place.

The results of the expedition cannot be comprehensively surveyed until the whole material and the copious collections, all of which have been brought back in good condition, get worked up and made accessible. It may, however, be already affirmed that the *Gauss* Expedition achieved everything in the region assigned to it that it was possible to achieve in the time available. It has discovered a new land, and thereby cleared up an old contested question regarding the nature and extent of the Antarctic continent for over ten degrees of longitude, certainly for about half of the debated region between Knox and Kemp's Lands, and perhaps also for the whole. At least, for the actual determination of the westerly tract, observations are now at hand by which light may be shed on the specified question. An important factor is the steep fall of the land down to a deep sea discovered by us; important, also, is the structure of the land, which consists of old crystalline rocks; lastly, it is important to find that this margin of the continent is occupied by a volcanic formation whose lavas contain molten gneisses which have been forced up with them from the bed-rock.

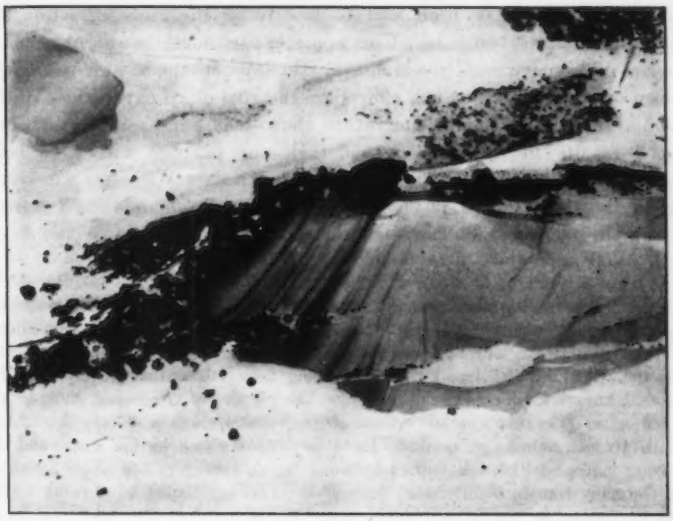
The inland ice covering the continent presents a picture of our former Ice Age, and is undoubtedly the vastest glacial area now existing. Yet it was still more extensive in former times, as shown by traces on the Gaussberg.

To this continent were directed our operations, which endeavoured to study all the phenomena presented by it. In the biological field, these studies ranged with Prof. Dr. Vanhöffen from the large marine mammals and the flocks of rare birds on the seaboard, through the numerous species of the smaller marine fauna to the bacteria which Dr. Gazert was able to detect, if not in the glacial sea itself, at least in its organisms, as well as in the rookeries of the stormy petrels on the Gaussberg, and in its few lichens and mosses. On the physical side, our observations extended from Dr. Philippi's studies of the Gaussberg lavas and of the continental boulders borne to great distances by the ice, through the numerous properties of the glacial sea and of the glacial formations by myself, up to determinations of the force of gravity, and to Dr. Bidlingmaier's determinations of the most delicate oscillations of the terrestrial magnetic forces, both in their normal periodicity and in their stormy perturbations, such as are displayed especially during the appearance of the southern auroras.

ICEBERG WITH DUST AND GRAVEL.

But should any one doubt that we there lived and worked in a new region on the fringe of the south polar continent, conviction will be afforded by the climate. In the north we had left behind us the zone of west winds and crossed a trough of low barometric pressure, remaining on its southern slope, where the pressure again rises to a maximum over the continent. Hence the prevalence of the easterly winds, which sweep down from the south over the vast uniform and but slightly inclined surfaces of the inland ice, and appear on the seaboard as easterly, Föhn-like gales.

These gales impart to the *south polar region its character and its limits;* by their frequency and uniformity they reveal the immensity



STRUCTURE OF THE ICE IN THE MORAINE ON THE WEST SIDE OF GAUSSBERG.

and the homogeneous nature of those Antarctic lands. Their northern confines may have some importance for *practical navigation* whenever there is a question of circumnavigating the zone of the Austral west winds.

But in my opinion the aim and results of an expedition are not to be weighed by particular scientific and nautical determinations, however interesting in themselves, and however stimulating they may naturally again prove in individual cases. More important is the main outcome, the fact that in the expedition are focussed the most diverse forces and efforts in order to test their value when combined for some new undertaking in vast unknown regions. In this respect the nautical and technical experiences undergone by our noble craft are no less

valuable than the fresh triumphs of industry which have placed at our service instruments, provisions, articles of sport and dress, and the thousand other objects supplied by the outfitters, or even than the methods of science itself adopted in our operations.

These were conducted in a new sphere of action, where no one could tell how matters would turn out under absolutely unknown conditions. Many things might miscarry when the ship was shattered or the instruments went wrong, and the energies of the expedition had then to be directed more towards the preservation of life and replacing the lost materials, efforts which merely yield negative results. But when an expedition happily returns, when it has succeeded in carrying out its plans and utilizing its appliances, and when in its new surroundings it has been able to modify in the right direction the principles of its being based on home experiences, then is obtained a series of positive results which may one day perhaps be able to enlarge even our own views. Such efforts are the goal of all expeditions in the wider sense, and should the future show that our operations yielded good results in this respect too, then our purpose will have been achieved; then will the newly discovered Kaiser Wilhelms II. Land, with the new knowledge yielded by it, become a foundation for fresh triumphs even in the home land.

Before the reading of the paper, the Chairman, Sir Thos. Holdich, Vice-President, said: Dr. Drygalski, who to-night is to give us an account of the German expedition to the Antarctic Regions, is, I believe, appearing here, favouring us with his presence, for the first time. He is, all the same, an old friend to British geographers. He is well known for his researches amongst the glaciers of Greenland, and perhaps even better known to a certain section of geographers, those who have had to deal with geodetic science in India, by the observations which he has made, and the correspondence which has ensued between Indian surveyors and those scientists in Germany who have interested themselves in the same subject. I think I need not go further in introducing him to you. We all welcome him here to-night as the representative of an expedition which in many respects has been working with our own in Antarctic Regions, and I have no doubt that you are impatient to hear from him an account of his own proceedings. I will now ask him to read his paper on the German Antarctic Expedition.

After the reading of the paper, the Chairman said: There are several gentlemen here to-night who can add to the interest of the meeting by making a few remarks on the very interesting paper which we have just heard read by Dr. Drygalski. Perhaps Sir John Murray, whose name must be well known in connection with the *Challenger* Expedition, will favour us with a few remarks.

Sir John Murray: I have listened with very great and very peculiar pleasure to this interesting account of the work of the German Antarctic Expedition, which has been so beautifully and interestingly illustrated. The peculiar pleasure I have had in listening to the lecture is largely derived from the fact that the *Gauss* has followed in the track of the *Challenger*, not only on Possession island and on Kerguelen, but also in that part of the Antarctic, where she was frozen in for the winter, and where a most important part of our labours took place. We of the

Challenger Expedition firmly believed, although we could not touch ice with our unprotected ship, that with our dredges we were able to see more of the Antarctic continent than even those who ventured with sledges upon the snows of that continent, because in our dredges we dragged up fragments of that continent in very great numbers, and the minute study of the detrital matter associated with them distinctly showed to us that, in the most southerly point we reached, we were not very far from the Antarctic continent. We, of course, could not state in miles what distance we were from the continent, but the gradual increase in bulk of these fragments showed us that when we were sounding in 1900 fathoms and 1200 fathoms we were not very far from the continent. Prof. Drygalski has told me that he believes that had we tried at our most southerly point we should probably have got soundings on to that continental shelf on which the *Gauss* spent her winter. We believed, before the *Gauss* started, it would be very difficult indeed for her to find a harbour in that region. I for one was always opposed more or less to the views of Prof. Neumeyer, that there existed anything like a warm current running south in this direction, although it was shown on German maps, etc. They have proved by their work that this continent exists where we predicted it would be found, although we thought there could be no possibility of finding a harbour. I cannot help thinking it was a most fortunate circumstance that enabled the *Gauss* to get into the position she did, for Prof. Drygalski has just told us they were not very far from that portion of the sea where the ice was continually in motion, and I cannot help thinking she must have got into a sort of bay. Now, as a naturalist, I do not think any scientific man could have wished a better position for a ship than that which the *Gauss*, by a fortunate circumstance or by chance, secured, because there she was right on the shelf, the exposed shelf of this Antarctic continent, and I look forward with very peculiar interest indeed to the results of the work of the dredge in two or three hundred fathoms of water off that continent, and to the report on the numerous things collected there. I also look forward with very great interest to an account of the motions of the ice. I should like to know if the tides there first went in one direction and then in another, or if there was always a current in one direction. The fact that naturalists have been making observations in that sea for a full twelvemonth ought to be of the utmost importance to the scientific man in interpreting the phenomena of the Antarctic. I cannot do otherwise than to extend to Prof. Drygalski, to his comrades, and to the German people, our very heartiest congratulations upon the success which has attended the labours of this expedition. There was one other point which was mentioned, apparently incidentally: the fact that fifty scientific men are at present hard at work upon these collections; this seems to show us it will not be long before we get the results of this expedition for purposes of speculation and for further investigation. I was rather interested, and perhaps some of you might not have noted the point, when Dr. Drygalski said they heated the boilers with penguins. I have always maintained that the penguin was the most important animal of the Antarctic. I suppose they took the skins off, and then they put the skins with the abundant oil into the furnace and burnt them. And when he said they preferred the light of the penguins, I suppose he meant they boiled down their fat and burnt the oil in their lamps. There were many other points which were extremely interesting to me, and upon which it would be interesting to have Prof. Drygalski's further views. I must once more express the entire satisfaction that it has given to me, and I think the account we have received of this most excellent piece of work will give complete satisfaction to the British people as well as to the German. The *Gauss* has performed her part of this great international investigation with singular success.

Sir LEWIS BEAUMONT: I think we must all be united in our desire to give Prof. Drygalski a very large meed of praise for the way in which the lecture has been delivered, for it has been delivered with a great deal of spirit and originality, and the remarks which accompanied the illustrations certainly were extremely amusing. There is no doubt that the work that has been done, considering that the expedition did not reach those very high latitudes which it is always the object and aim of Arctic explorations to reach, is remarkable, and I think that the photographs which illustrated the lecture are also extremely interesting and very descriptive of the work done by the expedition. I am not speaking as a scientific man, but I am speaking as one who has had the privilege of being in the Arctic Regions, and I can say that I sympathize with and add my congratulations to those of Sir John Murray as appreciative of the great and important work which the German Expedition has done.

Mr. J. Y. BUCHANAN: I do not think that I can add much to what my old colleague Sir John Murray has said, except to emphasize his remarks about the importance of the expedition which was commanded by Prof. Drygalski. I, in common with Sir John Murray, listened with the very greatest interest to the thorough exposition which Dr. Drygalski has given of the circumstances and of the conditions he witnessed during his long stay there. I have no doubt Dr. Drygalski was at first disappointed at the position in which his ship became fixed, but for scientific purposes it was probably as advantageous as could be wished. It would be interesting to know if, notwithstanding the very great difficulties which must have stood in the way, Dr. Drygalski had been able to carry out, on the inland ice of the Antarctic continent, investigations similar to those that are so well known in connection with his name in Greenland. At this time of the evening I will not keep you by making any further remarks, but I simply wish to add my testimony to the great value of the work done by the German Antarctic Expedition.

Sir ALBERT MARKHAM: I came here this evening for the purpose of listening to the very interesting paper that Dr. Drygalski has given us, and not with any intention of taking part in the discussion which I was aware would ensue. But as the Chairman has kindly invited me to say a few words, I will, as one who has had some experience in polar exploration, and is therefore in a better position to realize the difficulties incidental to ice-navigation, and can appreciate the way in which those difficulties are surmounted and overcome, add my congratulations to those of Sir John Murray, Sir Lewis Beaumont, and Mr. Buchanan to Dr. Drygalski, on his safe return to his own country, for the good work he has accomplished in the Antarctic Regions, and also express the pleasure that we all feel in welcoming him here to-night. In spite of many obstacles, such as Dr. Drygalski has detailed to us to-night—obstacles due to severe climatic conditions, to dense fogs, to furious gales of wind which are always, in polar regions, accompanied by blinding snowdrifts, —in spite of all those obstacles, he has brought his ship, the *Gauss*, back again with valuable and important geographical and scientific information. The Antarctic campaign, which started some four years ago, has now practically come to an end. It was not very long ago that we had the privilege of welcoming Prof. Nordenskiöld, who was the leader of the Swedish Antarctic Expedition; this evening we have the honour and the pleasure of according a welcome to Dr. Drygalski, the leader of the German Expedition, and you will all remember that not very long ago, on Good Friday morning, the news was flashed across from the Antipodes informing us of the safe arrival of our own Antarctic Expedition, the *Discovery*, in New Zealand, and I am sure I am only voicing your feelings and the feelings of every Fellow of the Royal Geographical Society when I say we are looking forward in a

very short time to offer such a welcome to Commander Scott and his gallant companions when they return to England, as they all so richly deserve.

Captain CREAK: I am afraid I have not very much to add to what has already been said. I would, however, refer to the magnetic observations made during the expedition. We are looking forward with great interest to the examination of the observations that have been made, and from what I have heard from members of our own expedition and what I have heard to-night, I believe a most valuable contribution to magnetic science is assured. I will say no more, but will conclude my remarks by reminding the members that in both expeditions the differential observations were made with instruments designed by Prof. Eschenhagen, of Berlin, and it is with sincere regret that I learn that he is no longer alive to see the results of his work.

Dr. H. R. MILL: There is nothing that I can profitably add beyond expressing my own personal feeling of hearty congratulations to my friend Prof. von Drygalski for this most admirable exposition of the preliminary results of his expedition. I should like to have heard a great deal more about the meteorological conditions, as I understand that in that department also he has done excellent work, and in due time we shall receive the full report. There seems to be no doubt that this expedition has confirmed what so many previous expeditions suggested—that there is practically a continuous coast-line running from Victoria Land to a great distance westward, almost as far as the meridian of the Cape of Good Hope. This and many other results will come out more clearly when the full report of the expedition is presented to us, and it is most gratifying and characteristic of the thoroughness with which German scientific work is done that so many specialists are already busy in compiling and discussing the data collected by the expedition.

The CHAIRMAN: As good geographers, we are all of us more or less acquainted with the progress of discovery at both ends of the world, both in the Arctic and the Antarctic Regions. But there is a particular feature about the present expedition to the Antarctic which has not distinguished those which have gone before it. The key-note of these expeditions has been combined international action. Now, we welcome such international action for a great many reasons. For one thing, it most certainly points conclusively to the final elucidation of the unsolved problems that may still exist at both ends of the world. We shall arrive at those results more quickly, more accurately, more satisfactorily, no doubt, by the combined scientific research of nations generally than we could possibly do by our own individual efforts as a country. There may still possibly be some shadow of a doubt resting over that great Antarctic continent. We do not know exactly whether it is one great continuous land, or whether it may be more or less an archipelago, a collection of large islands intersected by narrow straits and inlets such as we find in lands further north from the Antarctic—in Patagonia, for instance. But whatever doubt there may be about it will certainly be overcome; we shall know fully what the physiography of those regions is. But one thing there can be no doubt about, and that is about the energy and the ability which has directed this expedition, and which has led to such great results and such high achievements. We welcome Dr. Drygalski as a brother geographer, and especially as a geographer who represents in a high degree the scientific character of the German nation. When we think of the extraordinary difficulties that he had to contend with, those long Antarctic nights, the darkness, not of hours but of continuous days, the ship isolated amidst the ice with nothing but the weird ice-shapes all around it, and a silence such as might almost be felt covering the whole of the vast ice area around; when we think, moreover, of those most unappetizing-looking fish on which they had to live, for my part I cannot but recall the sentiment

which was expressed by the American ambassador lately in this hall, when Captain Peary was narrating similar experiences, when he said he was so glad he was not there. However, while speaking of the advantages of combined action on the part of many nations in such discoveries as these, we ought not altogether to forget what our friends in the Argentine Government have done for us. About this time last year it was my luck to visit the magnetic station which they had formed, not exactly on Staten island, but on an island called New Year's island, an island to the north of Staten island, which I conceive to be most important in connection with the observations which will be taken by all those expeditions working in the Antarctic seas. Not only that, but we must remember that when the Swedish Expedition was reduced to the last extremity, it was our friends the Argentines who sent a ship down, found out where they were, and brought them safely back. Well, we congratulate Dr. Drygalski on the success of the achievements which he has secured partly by his own skill and his well-known ability as a scientist, partly by the loyal co-operation of those who served with him. I am sure you will join me in thanking him most cordially for his kindness in coming here to-night and in telling us all about it.

Dr. DRYGALSKI: I thank you in the name of all my companions for the interest and the hearty welcome we have met with in England. It has been a very great pleasure for us to co-operate with the other nations, with England, the Argentine Republic, and Sweden, in the Antarctic Regions, and in such an unknown region as we have in the Antarctic, such international co-operation is in the highest degree desirable. The region is too large to be satisfactorily dealt with by one expedition, and every observation which is made has more value when it can be compared with similar observations made simultaneously elsewhere. The great point in the present state of Antarctic research is that different nations have been working in co-operation at the same time. In answer to the remarks made by Mr. Buchanan, I may say that from the winter quarters of the *Gauss* we could reach the coast and the Gaussberg, and we could make all requisite observations on the movements of the ice and their relation to ice-physics in the same manner as I did in Greenland ten years ago. Moreover, the situation of the German Antarctic station had the great advantage of being close to the sea, that is to say on the sea-ice itself, and so, besides the work on the land-ice, we could easily conduct our operations in the sea, our dredgings and soundings, and the bacteriological work, at the same time. In this way we also came to a knowledge of the land which is covered with ice. I am not aware that precisely similar observations have ever been made before, that is to say, that a knowledge has ever been gained of the magnetic forces, the tides, the force of gravity, the meteorological and other phenomena, at a fixed station over a sea 200 fathoms deep, with simultaneous observations of the same phenomena, for purposes of comparison, on a mainland coast 46 miles distant therefrom. Again I thank you all for the interest and the kindness we have found here in England, and I will conclude my remarks with the expression of my great pleasure that the *Discovery* has now returned to New Zealand, and I may at the same time express the hope that in the autumn of this year Commander Scott will reach his home-land with a harvest of rich achievements.

A PIONEER JOURNEY IN ANGOLA.*

By Captain BOYD A. CUNINGHAME.

THE main objects of the expedition whose results are here set down was an examination of the interior of the province of Angola from the sea-coast at Lobito bay†—a fine natural dock some 25 miles to the north of the port of Benguella—up to a point as near the present eastern boundary of the province as could be reached while the season was favourable, taking as the general line of direction the junction of the southern border of the Congo State with the northern border of North-West Rhodesia. The most easterly point actually reached was a spot some 50 miles east of the Kwanza river, where the highland belt sinks to a low depression.

Both the outward and return routes covered different ground, and included a triangular traverse of the littoral and mountain belts of the province, having a point (Kakonda) on the plateau some 200 miles inland from Benguella as the apex, the ports of Benguella and Mossamedes forming the extremities of the base. In addition, I also made a journey into the southern part of the province, in order to obtain cattle, from Lobango to Huilla, Chibia, and due east to the Kunene river; thence due south down the west bank of that river to Humbé, returning to Chibia in a north-westerly direction *viâ* Ediva and Gambos. There being no settlements of the first importance in the interior, the expedition did not attempt to fix the exact positions of Portuguese military stations and native villages, few of which are permanent, as changes of site are of frequent occurrence. But all other geographical, as well as geological, economic, and social points of value were noted as being of greater importance to the matter in hand.

The physical features of the province of Angola may be broadly apportioned from north to south into four distinctive belts, running north-east and south-west. The *coast belt* varies in width from 150 miles inland at Loanda to 40 or 50 miles at Benguella or Mossamedes, and is a sparsely watered, sterile region. Where water appears in any quantity, it is charged with mineral deposits and highly impregnated with sulphur: its constant use by man and beast is not only unpalatable, but involves some risk to health. Benguella itself, however, possesses a capital water-supply drawn from the Cavaco river. The carrier-path follows the course of this river for 40 miles, and a sufficient supply of water is obtainable thereon, though the river is

* Read at the Royal Geographical Society, February 22, 1904. This paper has been written with the co-operation of Mr. J. Withers Gill, F.R.G.S. Map, p. 248.

† *Lobito bay*, notorious in the days of the slave trade as the then unsuspected port of embarkation of slaves, while British cruisers were watching Benguella and Novo Redondo, has a depth of water sufficient to float large ships, which could unload close in shore off the western arm.

a sand-river in the dry seasons. This belt is enervating, relaxing, and malarious; intensely hot in the wet season; but the average maximum temperature at midday in the dry season is 70° Fahr., whilst at night it falls sometimes as low as 58° Fahr. The great heat of the day is tempered on the coast by an almost constant sea-breeze, which generally dies down at sunset. The coast bears an evil reputation for unhealthiness, not wholly undeserved; but this could be considerably ameliorated by intelligent attention to the simplest sanitary regulations, and to the ordinary provisions for the control and segregation of the native population, floating and permanent. Both of these common-sense precautions are entirely neglected.

The *mountain belt*, which extends for about 100 miles further inland, is the belt of luxuriant vegetation, of forests of lofty hard-wood trees, of fertile wooded valleys, and of fairly abundant water. The rivers, however, are sand rivers, and water is only to be obtained in the dry season by digging. Its characteristic features are its wildness and ruggedness.

From this the traveller climbs to the *plateau* or *highland belt*,* which extends from the Congo in the north to Humpata in the south, and has an altitude varying from 4000 to 6000 feet. Here the character of the country is undulating veld and prairie, and extensive well-watered, treeless plains. It is the home of vast populations of blacks, the haunt of such game as the rinderpest has spared, and the source of all the agricultural produce of the province. Its eastern boundary is some 70 miles east of the Kwanza river. Climatically, it is healthy and invigorating, and "a white man's country." The variation in temperature throughout the year is comparatively slight, the maximum at midday lying between 72° Fahr. and 59° Fahr.; the minimum morning temperature on the plateau lying between 50° Fahr. and 59° Fahr., while in the river valleys at the same hour it falls as low as 41° Fahr. to 43° Fahr. The *anopheles* mosquito occurs rarely here, and most generally in the vicinity of rivers. Malarial fever could, consequently, be easily controlled by an intelligent white population. Indeed, the missionaries resident in this belt report their own staff practically free of malaria, though it is for obvious reasons more prevalent among the travelling Boers and Portuguese traders, who contract it in the lower-lying belts.

The character of the fourth belt east of the Kwanza and up to the

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* The following table of altitudes will make the extent of the rise clearer:—

57	miles	out	of	Benguella	the altitude was	1350 feet.
117	"	"	"	"	"	2500 "
120	"	"	"	"	"	3000 "
160	"	"	"	"	"	4800 "
180	"	"	"	"	"	5400 "
200	"	"	"	"	"	5900 "

plateau of North-West Rhodesia, which was not visited by the expedition, is generally that of an inland depression formed by the basins of the Kassai and upper Zambezi. For some 180 miles eastward from its western boundary, in the direction of the Portuguese post of Mochio, it is known as the "hungry" country. To all appearances this qualification is not due to exceptional poverty of natural resources, for it is a level, well-watered, well-timbered, and beautiful tract of country,

THE "BURRO-BURRO."

with a good soil. It is "hungry" in the sense that it is entirely uninhabited, and no food-supplies are procurable. For some hitherto unfathomed reason, it is a country tabooed. The native explanation is that "a king's curse rests upon it." This "hungry" country ceases some 20 miles west of Mochico. Thence for some 200 miles eastward to Nana Candundo and the upper Zambezi the country is low-lying, unhealthy, and swampy in many places, but elsewhere well wooded and generally densely populated. It is well drained by numerous streams and eight larger rivers, all running south. Amongst the latter are the Luena, Lumessi, Mfua, and Lufua.

Kakonda, a trading settlement some 200 miles from Benguella, formed the apex of the triangle previously referred to, and was our starting-point for the interior, and the objective of our return journey. The country along the sides of the triangle, from Benguella and Mossamedes respectively, to Kakonda is fairly well known and frequently traversed by traders and by the handful of Boers who trekked into Angola in 1880.* The whole of the transport of the country, such as it is, is in the hands of the latter. It has, moreover, been described by Serpa Pinto and Capello and Ivens amongst comparatively recent geographers, though our Benguella-Kakonda route was more direct than theirs, which took a southerly bend through Dombe and the country of the Killenges, thence northward to Kakonda, forming roughly the segment of a circle of which our route was an arc. As this portion of Angola, therefore, is fairly well known, my observations may more profitably be confined to the journey inland from Kakonda and back, where new ground was broken,† and to the journey to the southern portion in quest of oxen. They will more conveniently fall into the four divisions of (1) the journey north-east to Bihé; (2) the turn south to the Kissalonga river; (3) the turn west to Kakonda; and (4) the southern journey to Ediva and Gambos.

Quitting Kakonda on June 12, 1903, we arrived at Chisambe, a distance (registered by cyclometer) of 255 miles, on July 17, having followed throughout the traders' waggon road, roughly prospecting the country for some distance on both sides of the road. This road, which has permanently been converted into a waggon track by Boer transport riders, runs some way to the north of the carrier track followed by Serpa Pinto and Capello and Ivens. Chisambe is in the Portuguese district of Bibè, of which Fort Belmonte (210 miles from Kakonda) is the official centre. Belmonte recalls the name of Silva Porto, well known to geographers as the merchant-traveller of the Bihè and Lunda districts of Angola, whose employés crossed Africa in 1854 and met Livingstone, and whose help and hospitality to subsequent travellers up to the days of Cameron and Capello and Ivens is memorable. The whole district is thickly populated with natives, whose principal occupation outside their kraals is that of "carrying," or travelling for their headmen, to distant Lunda, the Kassai region, and Barotseland, in search of wax, rubber, and boys to fill gaps in the

* A graphic description of this trek was given to us by one of the participators. Two hundred and fifty waggons left the Transvaal *viâ* Khama's country and Lake Ngami, entering Angola by the Humbè district. The trek lasted five years, and encountered disasters innumerable. The Boers arrived in Angola, having lost 250 of their people and some 9000 cattle.

† Serpa Pinto's route from Kakonda to Bihè was more southerly than ours. Cameron's journey to Benguella took him more to the north, as he approached Benguella through the mountainous region of Bailundo by the carriers' path. The waggon road approaches Benguella in a more direct line.

ranks of *servicaes*,* all of which find their way eventually to the coast ports.† The story has often been told, and it loses nothing in the telling when repeated round the camp fires by those born romancers, the African negroes, how Bihè, the mighty hunter from beyond Humbè, came into the country with many followers, and, falling in love with the beautiful daughter of the reigning chief, carried her off in the good old style of "those shall take who have the power," and then quietly took over the country with his bride. His followers copied so amiable an example, and mated also with the women of the country. The roving disposition of the Bihenos is thus accounted for as a trait inherited from their wandering forefathers. From this disposition has arisen their unique attitude towards the trade of the province.

The district of Bihè has always been the *entrepôt* for the time being of the staple trade of the country. Products are collected by these enterprising travellers from regions at a distance quoted as fabulous by their more timid neighbours. In the days of the slave trade it was the great *entrepôt* of the multitudes of slaves shipped from Benguella; and the importation amongst them of strange tongues due to this fact is probably the reason why the evidence of language is weak in support of the evidence of tradition as to the origin of the tribe given above. Nowadays the fact remains that a considerable portion of the total exports of native produce from Benguella is obtained by the Bihenos, who act as intermediaries between the natives of the rubber-producing districts of the Congo basin and the European trading houses. The journeys they make are extensive enough to be remarkable, and they frequently extend over considerable periods of time. These journeys, commencing in undisciplined raids for slaves, have gradually, by the action of economic laws, and under the direction of white traders, been systematized into their present extensive commercial ventures.

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* A system of indentured labour recognized by the state. The *servicaes* are registered by their proprietors, who have a call on their earnings if they work for other people.

† The exports of rubber from Benguella for ten years have been—

	Kilos.	
1893	1,340,300	
1894	1,153,600	
1895	1,306,000	
1896	1,605,800	
1897	1,683,247	
1898	2,246,431	
1899	1,882,201	
1900	1,228,995	
1901	1,271,645	
1902	504,843	(decrease due to a Portuguese punitive expedition to the interior.)
1903	658,069	(for five months only to end of May.)

The male population not being stay-at-homes or fond of manual labour, there is, nevertheless, a very large area of ground under cultivation by the native women, mealies and manioc being the principal crops. Water is plentiful, and the soil is light and sandy except in the "marambas" and on the Burro-Burro plain, where it is black and peaty. The two latter are striking features in the journey. Marambas are the springs rising near the summits of the high belts, and draining off from the spongy soil into larger marambas, which eventually become rivers. This is a strongly marked characteristic of the elevated country along which our route ran. The road leaves the low wooded scrub and passes into an open space aptly comparable to a snipe bog, having a stream of clear water, sometimes 15 feet in depth and only a foot wide, running in the middle. They are the *bête noires* of a waggon traveller, as they mean usually some 50 yards of bog to be traversed, which it is necessary to "corduroy," before the sponginess disappears and the low scrub begins again. The Burro-Burro is a long treeless plain, 28½ miles long and from 12 to 15 miles broad, entered by the road some 180 miles distant from Kakonda. The sources of the Kunene and Kubango rivers are in the Burro-Burro. Six rivers in all were crossed in this section of the journey, viz. Kwando, Kwima, Kunhugamwa, Kutato, and Kokema. All were flowing south to the Kunene or Kubango. The road therefore follows the divide, the highest altitude recorded being 6080 feet at a point 150 miles from Kakonda, the lowest 5260 feet at Kunhugamwa river. Both the Kwando and Kunhugamua are at least 40 feet wide at the crossing, and the depth of water at the date of crossing (June) was not under 10 feet. The others were very roughly bridged with logs.

Granite, continued throughout the mountain belt, formed the country rock for some distance past Kakonda. Red sandstone hills appeared near the Kwima river, and continued at intervals, all showing strong impregnations of copper. Float quartz was very general, also beds of limonite, up to the Kokema river, when indications of felspar, diorite, and basalt appeared. North-eastward from Chisamba a flying geological survey was made up to Ondulu, which lies in a basin of calcareous rock showing frequent heavy outcrops of iron. This basin is some 5 to 6 miles in diameter, and has at its south-western and north-eastern corners high peaks composed almost entirely of iron ore; and at its north-western corner an occurrence of geysers or hot springs, with sinter beds, somewhat similar to those north of Victoria falls of the Zambezi.

From Chisambe the expedition turned south towards the Kissalonga river, whence it was proposed to cut a new track westerly as the crow flies back to Kakonda. Starting on July 17, and taking two days to cross the Kwito river, which is some 30 feet broad and 6 to 10 feet deep, flowing between high sandy banks, we reached on July 28 the Kokema river. This was fully 180 feet wide and

10 feet deep, with a current flowing lazily by flat sandy banks, and forming numerous lagoons and swamps, thickly fringed with reeds. On the south bank of the river at the point of crossing is the large kraal Gando, peopled by the Ganguellas, or "Stammerers," thus christened from their peculiarly jerky manner of speech, which is doubtless partly due to the artificial gap made in the upper row of their front teeth. Nearly all the active portion of the population was absent at the date of our visit in the rubber-producing districts. Enormous tracts of land were under mealie and manioc cultivation. The timber, which had hitherto been soft-wood scrub, useless but for firewood, was, at our outspan at Luma on August 14, some of

GANDO AND THE KOKEMA RIVER.

the finest we had seen in Angola. Here the trees were 60 feet in height and 12 inches in diameter.

Travelling south between the Kissalonga and Kwanza, the daily treks averaged only 2 miles, a road having to be cut through dense wood scrub. Forty miles south of Gando, at the source of the Kamunui river, is another large kraal, Muvundu. This was the largest kraal seen in the country, its ring fence of sycamore trees being quite $1\frac{1}{2}$ miles in circumference, and its population falling little short of 3000. From here I made a flying journey in a south-easterly direction to find and examine the Kwanza river. After travelling about 11 miles I struck the river, and exploited 35 miles to the east of it, and 10 miles along the banks both north and south. From a point of vantage I could see fully 20 miles further east than where I halted, and observed no change in the character of the country, its similarity in all respects

to that through which my party had been passing being maintained. From native reports, I gathered that the depression of the sand-veld commenced about 70 miles east of the river. The Kwanza where I crossed was about 20 yards wide, with hard sandy banks, the water being from 10 to 12 feet in depth, and the current running strong.* It was full of crocodiles.

On August 17 I returned to Muvundo, and shifted the homeward course south-west by west in fulfilment of the intention to cut a road straight back to Kakonda, which was hit successfully on September 29.

The rivers crossed during the first part of this journey were the little Kissalonga, the Kissalonga, and the Kunde. The first named is a tributary of the second, and all three flow into the Kokema. The sources of all these rivers are given erroneously on existing maps. They all drain northward into the Kwanza. The next in succession was the Kakuchi, which is the first of the big rivers running south to the Kubango; then at intervals of 12 miles, running parallel to each other and separated by high belts, are the Kuchi, Kutato, and Kubango. The Kakuchi, across which we were only able to make a passable drift by the aid of dynamite, was 40 feet broad and from 8 to 10 feet deep, with hard sandy banks lined and flanked with enormous granite boulders. The Kuchi was 60 feet wide and 12 feet deep, with perpendicular banks of hard sand some 10 feet in height. It broadens out into marsh and small lagoons, and is doubtless an imposing stream when in flood. We crossed the Kutato at a point where there were rapids of great beauty. The drift had a dangerous look, but was successfully negotiated. It was 50 feet wide, and from 8 to 10 feet deep in the still water. The rapids were running very swiftly through huge granite boulders. The Kubango, which was 84 feet wide and some 6 feet in depth, had a swift current running between steep sandy banks. It also opens out into swamps and lagoons, thickly fringed with high reeds. Forty-five miles further on the Kunene, the most beautiful of all the Angola rivers, was crossed. It was 80 feet wide, 8 to 10 feet deep, with high sandy banks 8 feet high. The current is swift, and the many granite boulders in its hard sandy bed form numerous rapids. On the east bank of the Kunene at Koloiko, a range of sandstone hills (altitude 5695 feet), in which considerable quantities of conglomerate were observed, was traversed. The Liamengo, the Calae, the Kwando, and Kalapi were also crossed on our return journey to Kakonda.

It is worth mentioning here that I was told by a white settler, but was not able to verify his interesting statement, that there were the

* Serpa Pinto must have crossed the Kwanza some miles to the south of this point; Capello and Ivens a little further north. The disparity between the breadth of the river as reported by them respectively and here registered was doubtless due to the season, my visit occurring at the height of the dry season.

ruins of a fortress-like building of unmortared granite blocks in the neighbourhood of our second day's trek from the Kubango. It remains for some more fortunate traveller to find and examine these relics, and compare them with the well-known "ancient ruins" of Rhodesia. It would be a discovery of startling interest should anything similar be found so far west.

Geologically, the country traversed on this return route was far more interesting than on the outward journey, and on this account it

GANGUELLA WOMAN, SHOWING HEAD-DRESS

is deserving of further examination, especially the high ground east of the Kunene, where large outcrops of auriferous banket were found. The country was still densely populated, some of the kraals containing 2000 to 3000 inhabitants. A very picturesque setting is given to the kraals by the general custom of planting a fence of graceful sycamore trees (*cinchotina*) round the entire collection of huts.

The principal tribes east of the Kunene are the Ganguellas, Lumibas, and Luenas—all timid, friendly, and pleasant people. They

were most hospitable to the expedition, and exhibited no warlike tendencies. Several of the kraals visited were peopled entirely by blacksmiths working the abundant ironstone.* It is a notable fact that apprentices are sent from great distances to these "smithy kraals" to be taught the art of working that metal. It was distinctive of these kraals that the huts were shaped exactly like a megaphone. No variation from the often-described tools and plant of similar artificers in other parts of Central Africa was apparent. These people own a few cattle, which they procure from Barotseland. They wear larger loin cloths than other tribes. They are a friendly, industrious, and peaceful race. Their kraals live harmoniously with each other, frequently owning a mealie garden in common. Their territory extends from the Kwanza to the Kubango. It was up to this limit that their head chief Chavana, whose kraal is at Ochisaya on the Kakuchi river, gave us safe conduct. In fact, his representatives accompanied us sometimes in a body sufficiently numerous to turn our prosaic caravan into a triumphal progress. A hundred singing and dancing natives would precede the waggons, to professedly point out the best road, to command in the name of their over-lord presents at the villages passed *en route*, and to perform many kindly services, sometimes useful, sometimes embarrassing. Every detail of our daily existence excited boundless interest. Hundreds of pairs of eyes intently watched my ablutions, the interest becoming breathless at the shaving and tooth-brushing stages thereof. And on one occasion quite 500 natives sat round our breakfast-tables. We lived literally "in the public eye." It was at this portion of the tour I became a practised adept at receiving deputations, and realized what hard work it entails. The primitive simplicity of these people may be gathered from the following episode, which occurred on the Kokema river. An old native harangued us loudly, as follows, in a speech which doubtless lost none of its point in passing through the interpreter's brain, but it is taken down as literally as possible, and not intentionally modelled upon the Hebrew prophets:—

"Who are these people? They are more than men. Nothing daunts them or hinders their progress. Rivers they cross with extraordinary ease and speed. Through thick bush they travel as rapidly as in open country. Fish in the river they slay as many as they desire. Birds flying swiftly and high in the heavens are not safe from them. They roam the veld as fearlessly as the lion; they crash through it like the elephant. What nation are they of? Who are they?"

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* The ironstone common to this district is a ferruginous conglomerate—a brown iron ore cementing small water-worn quartz pebbles. After long exposure, when the quartz pebbles have been washed out by denudation, the ore is black and cinder-like in appearance. It is an ore very commonly used by natives for smelting, as it contains an appreciable quantity of silica, which, forming a flux, makes it easily fusible and easily worked by their primitive methods.

From the Ganguellas country come large quantities of the rubber that is classed at Benguella as "second quality." It is gathered from the root-sucker of a creeper, probably a Landolphia.

Brief mention may be made of the game seen or procured by the expedition. The country being thickly populated, this was never very plentiful, but, on the other hand, we were never at any time short of fresh meat. It is comprised in the following list, viz. lion, elephant, hyena, jackal, buffalo, leopard, eland, roan antelope, water-buck, blue wildebeeste, letchwe, reed-buck, oribi, duiker, steinbok, blauwbok, bush-buck, hippopotamus, spring-buck, kudu, zebra, wild pig, and wild dog. The fish also caught were the African yellow fish, barbel, crocodile fish,

KAKUCHI RIVER.

and a species of bream. The latter lives in the "runs," and is naturally the best eating.

Turning now to the journey taken through the southern portion of Angola in search of cattle, it is interesting from its striking contrast in the physical characteristics of the country and people to those just described. Mossamedes was the port where the expedition disembarked and fitted out for Lobango. The country between that port and Lobango, with its long weary stretch of "thirst land," calls for little mention. Amongst others, it has been traversed and described by Capello and Ivens in their journey in 1884 to the Zambezi.

North of Lobango the general character of the country is hard-wood scrub and what is known in South Africa as "sour veld." South of Lobango lies the cattle country, which is low-lying and covered with sweet grass and thorn bush. The route taken was from Lobango to the Portuguese trading settlement of Chibia, thence due east to the

Kakulovar river (called by the Boers "Honing" river on account of the sweet grass abundant there), following the course of the Chipungo river to Luseke on the Kunene, where the Kwe river enters the latter. Thence I travelled south along the west bank of the Kunene, following a track once before travelled by a Portuguese waggon-owner. Not without misgivings as to the result, I passed through the Mulondo* country, into which neither Boer nor Portuguese will now venture, and paid a visit to Dongulla, its chief kraal, where the king Hangara resides. This potentate has a most evil reputation, and the whites scrupulously avoid coming into contact with him, as he is credited with contributing to the disappearance of several travelling parties. His aptitude for removing obstacles of this nature and appropriating their property was unpleasantly impressed on me before my visit. The Mulondo people are a wild, independent, and warlike race. They have thrice routed Portuguese expeditions sent against them. They acknowledge the suzerainty of Olulu, the king of the Kwinhamas, the great raiding tribe of the province, who are entirely independent and have never been subdued.

I was the first Englishman Hangara had ever seen. He was complimentary enough to inform me, at the close of our interview, that he could easily see that I was a very great man—"as great a man as himself." This tribute was not spontaneous, but the more gratifying in that it was called forth by the chief's admiration, not only for the studiously independent and dignified attitude I took care to maintain, but also for the punctilious respect for my own susceptibilities that I had exacted from the gentleman himself. We parted good friends, exchanging presents, Hangara receiving a bottle of whisky and a Bryant and May match-box, which he reciprocated with a nice cow and calf. A considerable portion of the Mulondo country is covered with an enormously thick elephant thorn scrub.

From Dongulla I went southward to Kiteve, still following the course of the Kunene. Kiteve occupies a position as malarious as it is picturesque on the banks of the Kunene, at the edge of the swamps, which are here about 1½ miles wide. It contains a Portuguese fort which has been ungarrisoned for fifteen years.† The inhabitants of the country had been decimated by small-pox at the time of my visit. Thence, still travelling in a southerly direction, I reached Humbe,

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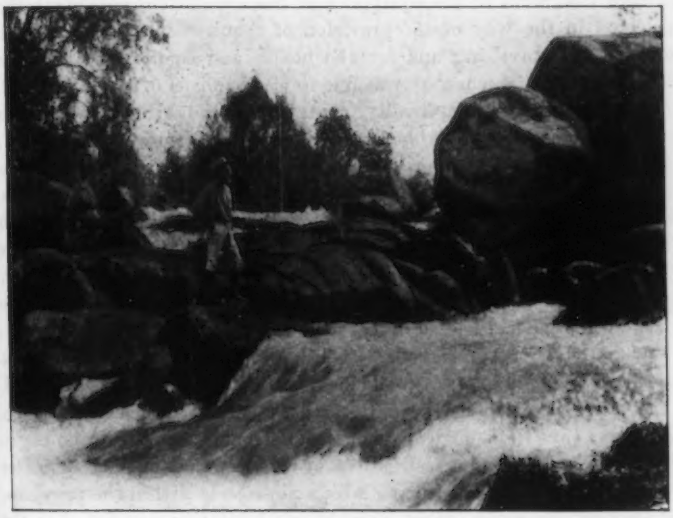
* So called from the abundance of the mulondo fruit. It is about the size of a cricket-ball, with a hard green shell, which contains scarlet pips like a pomegranate, and it grows on trees about 20 feet high. Serpa Pinto records a similar fruit under the name of "mapole" as being common in the Ganguellas country, but we saw none there.

† Capello and Ivens visited Quiteve in June, 1884, and reported that there was there a vast building which had been for some years in the occupation of a Portuguese, probably a trader.

where there is a Portuguese fort and a trading store. Humbe is situated a short distance from the banks of the Kunene, near the point where the Kakulovar enters the latter. Humbe was the most southerly point reached. It is intensely hot. The natives are a very fine type, being hard workers, good fighters, and having a demeanour which can be fittingly described as gentlemanlike. From Humbe I turned north-west along the right bank of the Kakulovar, through the country of the Ombanjas, who are another turbulent race. These people are very scantily clothed, and own large numbers of cattle. The next point of interest was Ediva, about 8 miles south of the Kakulovar. This place is called by the Boers "Lord Mayo's fontein," in recollection of Lord



KUNENE RIVER RAPIDS.

Mayo's hunting trip in 1882. At that time it was a celebrated centre for big game, but has now suffered considerably from the ravages of rinderpest. The Gambos country was also passed through, but it was then famine-stricken. The Portuguese fort here is well commanded by a huge black granite kopje, which is a landmark for at least 50 miles. At the top of it are extensive caves permanently occupied by hostile blacks who have never been dislodged. The Gambos natives are proverbially idle and lazy. One of the natural features of this country is the abundance of baobab trees of great size. A doubting native here took my bet of my rifle against his own cow and calf that I would pierce a good-sized tree, at least 10 feet in diameter, with a

bullet. In great fear and trembling, the native lay down behind the tree to hear the bullet come through. Needless to say, I won the cow and calf. From Gambos I returned to Chibia, and thence to Lobango.

The following game were encountered on this trip, additional to the species previously detailed as seen on the northern journey, viz. harte-beeste, oryx, impala, ostrich, rhinoceros, and giraffe.

To sum up. The immediate objects of the trip were satisfactorily accomplished, and it is to be hoped that some slight addition to the geographical knowledge hitherto available has also been made. Save for the ordinary accidents of waggon travelling, which one must always expect and always be ready to cope with, everything went without hitch. Much of this was due, of course, to the forethought and experience that went to the equipping of the expedition, nothing being neglected in the way of the provision of requirements essential both for successful travelling and for the health and comfort of the white and black staff. Much, also, was due to the *personnel* of the expedition, who worked throughout loyally, contentedly, and with an admirable spirit of *camaraderie*. The black staff were always happy and contented; the white staff always interested and thorough. Infinite patience, an inexhaustible supply of good temper, unwillingness to anticipate evils, but facing them smartly when they came—it was this spirit which carried us through. While as regards health, we had the advantage of travelling through a highland country with an invigorating climate, and during the dry season, and no serious illnesses affected us on the journey when we had once left the coast belt behind us.

To the testimony of travellers in other parts of Central Africa not under the Union Jack, we can add our testimony to the gradual spread of the impression among the natives that dealing with men of British race means that rigid justice which is the strongest appeal to the negro mind. Amongst other investigations, it was necessary to make inquiries as to the possibilities of securing labour on projects within the province, and amongst the active tribes scarcely any hesitation was found in the asseveration that it would be forthcoming in abundance for Englishmen, for that was an assurance of fair wages and regular pay. Moreover, an incident was described to one of us by a leading merchant in Benguella as coming within his own experience during the past year. Amongst a crowd of rubber-carrying natives who came to his factory were four men from the Zambezi, who refused to take the customary present of *aguardente* which is served out preparatory to trading. They said they came from British country where "strong water" was interdicted, and were quite ready to trade without it. I do not claim that their refusal was due to a high standard of moral behaviour. It may be that they were fully alive to the advantages of trading with their wits unmuddled. But, in any case, it is a small fact with a big significance.

There is another small matter of general interest. I had to consider

the advisability of confiscating all finger-pianos and other instruments from my native *entourage*, so universal is the nostalgia induced by music. At any halt it is possible that your men may sit under a tree and begin to play to themselves, when the meaningless tinkle will call up visions of the kraal they have left behind them, and their yearning for home becomes so irresistible, that without a moment's consideration they will abandon everything and break away, leaving you helpless. Again, the Kwinhamas, that wild tribe in the south to whom reference has already been made, have, in contradistinction to negroes generally, no musical proclivities; and it is a notorious item of experience that, should they collect together and start chanting in unison, they will inevitably have

A "SMITHY" KRAAL.

disappeared by daybreak. Though, by the way, chanting is somewhat of a euphemism for the unmelodious concatenation of raucous sounds produced on these occasions.

In conclusion, the province of Angola presents many points of interest, and it is satisfactory to note that its natural advantages will soon be more fully exploited by British enterprise, with the concurrence of our old-time allies the Portuguese. Being the natural highway to the coast from the rich mineral inland region over its eastern border in the 12th parallel, it will inevitably possess in the future a closer interest for Englishmen than it has hitherto possessed in all its three centuries of European occupation. It must not be assumed, however, that the absence of any large amount of general knowledge in England

of this province is due to inactivity on the part of the friendly nation to whom it belongs. From at least a century prior to the days of Capello and Ivens many Portuguese travellers have from time to time made adventurous journeys into the interior, both from Mozambique and the west coast. Rather is it due to the fact that the results of their labours have not been generally accessible, in some instances perhaps from motives of policy, in others from lack of either the desire or the opportunity to spread them abroad. If this brief sketch has thrown a more diffused ray of light athwart a portion of Africa, it will be matter for gratification.

After the paper (which was read at the same meeting as that of Major Powell-Cotton's paper on Northern Uganda, p. 56), the CHAIRMAN (Colonel G. E. CHURCH) said: The papers to which we have listened have been of immense interest, and have commanded your close attention. That upon Angola was on a section of Africa with which not all of us are very familiar. Angola was discovered by the Portuguese seven years before Columbus reached America, but no settlement was effected there until that made by Paul Diaz, the grandson of the great Bartholomew Diaz, who was the first to round the Cape of Good Hope. Angola seems very similar to the country on the opposite side of the Atlantic called Brazil, especially that part of it between 6° S. lat. and 17° S. lat., not only as regards climate, but in a geological sense. The basic rock, the gneissic, underlies very ancient rocks, while at the same time the land rises in plateaus. I believe that in 1641 the Dutch captured the strongholds which belonged to the Portuguese in Angola. They were retaken by a Portuguese fleet sent from Brazil. About that time the Dutch, under Maurice of Nassau, were endeavouring to settle the district near Pernambuco. These two lectures, relating to opposite sides of Africa, have conveyed to our minds the extraordinary features of the native tribes, and they bring up the thought that Africa long prior to any knowledge which we possess of it has been populated by races who have become very much intermingled, and especially in Angola there seems to be every evidence of a great number of ethnological characteristics which indicate raids and wars and mixing of populations. I was specially struck with the remark by Captain Cuninghame upon the ruins of some very ancient towns built of unmortared blocks of stone, that indicate the existence of a prehistoric race, which makes us wonder if Africa once had a civilization of its own. I can only call upon you to extend your cordial thanks to the two lecturers whose papers we have listened to.

QUEENSLAND.*

By Dr. J. P. THOMSON, Secretary of the Queensland Branch of the Royal Geographical Society of Australasia.

PHYSICAL FEATURES.

QUEENSLAND occupies the north-east quarter of Australia. The area of the colony, including the islands, is 668,497 square miles, and the coast-line about 2500 miles in length. Its physical structure is simple

* Read at the Southport Meeting of the British Association, September, 1903.

enough, and there are few striking topographical features, such as occur in the south-east corner of the continent. By this it must not be inferred that Queensland is destitute of mountain scenery, but on the whole its elevated features are less broken and distorted than in countries where bold ranges and deep valleys form conspicuous landscapes. The highlands occur chiefly in the neighbourhood of the coast. Under the somewhat general designation of the Great Dividing range, they extend, in a more or less continuous chain, from the extreme south-east corner of the colony, at Point Danger, northwards, and almost parallel to the coast, through its entire length to Cape York. This great coastal range forms the anticlinal axis of the entire mountain system, from which radiate numerous lateral elevations, that form the watersheds between the rivers flowing westwards into the interior of the continent, and those that empty into the Gulf of Carpentaria. In some places the eastern side of the range approaches to within a short distance of the coast-line, and some of its radiating spurs even encroach upon it. In the southern portion of the colony there are transverse ranges extending westerly and south-westerly from the Great Dividing chain, and these form the watersheds of the numerous streams that flow into the Darling river. The rivers which fall into the head of the Gulf of Carpentaria are separated from the Georgina and Hamilton and the Diamantina streams, that flows south-westwards into the interior of the continent, by Barklay's tableland and Selwyn and Kirby's ranges. Gregory range, a lateral extension of the Great Dividing range, running north-westwards, divides the waters of the Gilbert and Flinders rivers, both of which flow into the gulf. Drummond range lies between the waters of the Belyando river and those drained by the Nogoa and Isaac streams. The waters of the Burnett and Auburn rivers are separated from those drained by the Dawson river by Dawes range and its collateral offshoots, while between the Dawson river and the Comet intervene the Carnarvon and Expedition ranges.

Macpherson's range is a rugged and picturesque forest-clad chain of mountains, culminating in Mount Lindsay, 4064 feet above sea-level. All along this great frontier chain, whose crest is studded with lofty and precipitous peaks, the scenery is magnificently grand, and the climate delightful throughout the year. The soils are fertile, and the vegetation luxuriant. The elevations of the coast or Great Dividing range, that extends northwards, vary from 2000 to 4000 feet or thereabouts above the sea. The highest points of its crest occur in the Cook district, where Mounts Bellenden-Ker and Bartle Frere attain altitudes of over 5400 feet. The topmost peaks of this great chain of mountain ranges represent the earliest insulated rudiments of what is now the Australian continent. It was some time during the Palæozoic period—an era that gave birth to widely distributed land masses in many regions of the globe—that several predominating areas of elevation were

projected above the surface of the vast ocean on the east coast of this country. These now form the principal topographical features that control the drainage areas of many coastal and inland streams, whilst they also exercise a material influence in modifying the heat of the summer season.

The river systems, as established and regulated by the broad physical configuration here indicated, may, upon geographical principles, be conveniently classified into four clearly defined categories. First, there are the rivers that drain the eastern slopes of the main range, and flow into the Pacific ocean. These are mostly comparatively short and rapid streams, that sometimes overflow their banks during abnormal rainfalls, and inundate large areas of low-lying country. Local physical conditions render almost the whole of their drainage areas effective, and consequently they carry an enormous quantity of water when flooded. It has, in point of fact, been estimated that during the phenomenal flood of 1893 the volume of water discharged by the Brisbane river was equal to the ordinary discharge of the Indus of Sukkur, and "very nearly equal to the maximum flood-season discharge of the Nile at Cairo." The principal rivers here are the Fitzroy, the Burdekin, and the Brisbane. The second system of rivers flows into the Gulf of Carpentaria, the third south-westerly into the interior at the continent, and the fourth into the basin of the Darling, in the southern portion of the colony.

The whole of the country, however, is naturally divided into but three great primary regions, each possessing distinctive physical and climatic characteristics. The eastern division comprises the whole of the immense tract of country flanked on the east by the coast-line, and on the west by the Great Dividing range. It is abundantly watered by the copious rainfall that is everywhere distributed over its surface throughout the year, and by the numerous rivers and small streams that traverse it. The climate of this district varies from a mild tropical type to one of the most invigorating and health-giving temperate zones of the globe. The remarkably fertile soils are of the richest and most varied description. They comprise the immense alluvial deposits of river-basins, the volcanic ejectamenta of tablelands, and the loams of the slopes. The forests are rich in valuable timbers, and everywhere teem with animal and bird life; whilst, within the tropical belt, prolific nature has clothed the surface with vegetation of unsurpassed luxuriance. Here the various scrubs are remarkable for the charm of beauty, and often are dense enough to exclude the rays of the sun. The mountain and woodland scenery is very beautiful, and the adjacent island landscape delightful, the climax of grandeur being attained in the mighty waterfall of the Barron river, of which so much has been said and written, both real and imaginary. In flood-time the wild sublimity of the scenery here is extremely grand, the rush and noise of the turbulent and sweeping flood-waters being indescribable, as they madly

leap over the edge of the shelving precipitous rocks some 600 feet high.

The second geographical division comprises the whole of the watershed of the Gulf of Carpentaria. It lies wholly within the tropical belt, and is made up chiefly of extensive plains and undulating lands. The country is especially adapted for pastoral rather than agricultural purposes. There are, however, several scattered areas of remarkably rich, deep, loamy soil, mostly in the basins of the Batavia and the Embley rivers, on the eastern side of the gulf, that could be cultivated. There are fine forest timbers here, and the whole district is abundantly watered. The rainfall is copious, and many rivers traverse the country,

QUEENSLAND. CORAL REEF NEAR CAIRUS.

chief amongst them being the Flinders, the Mitchell, the Gregory, the Leichhardt, the Norman, and Batavia. Several of these are navigable, although the extensive mud-flats along the shores of the gulf greatly interfere with the free movements of large vessels. As a first-class pastoral country, the district possesses many natural advantages that are entirely wanting elsewhere. There is, first of all, abundance of water, and the grasses are luxuriant and nutritious. At the mouths of the Batavia and Embley rivers there are commodious harbours, where stock could be shipped, and every facility exists for the establishment of industries and the further development of the resources of the country. The drawback hitherto has been the distance from the capital of the

colony, but, as railway extension is now being rapidly carried on everywhere throughout the country, the disabilities with which the district has formerly had to contend will not much longer impede its progress.

The third great division is the largest of all, and, in point of importance, only second to the first one. Indeed, it may be considered that this magnificent western district, comprising as it does the whole of the immense country west of the coast range, is in some respects superior to the others. It embraces the famous Downs country, which for richness of soil and magnificence of climate is probably unsurpassed in any other part of the world. Extending far away to the west, into South Australia, these fertile plains and rolling downs cover enormously extensive Cretaceous beds, holding artesian water at varying depths. The irregular, uncertain, and always scanty rainfall of the far western district was formerly a great drawback to pastoral enterprise. During seasons of prolonged drought, run-holders suffered greatly by loss of stock, for over the vast surface of the rich soil no grass could be obtained, and other forms of vegetation were parched and withered. Now there is happily a complete transformation of the face of some of the country. Stern and relentless nature has to a certain extent been subdued by the art of man, and vegetation now flourishes luxuriantly on the surface of soil abundantly watered from artesian sources, whilst thirsty stock no longer wander madly and helplessly about over parched plains in quest of much-needed water. The main trunk lines of railway extend far away towards the western frontier, and the country is becoming settled in places where formerly not a single habitation was to be seen. In many parts the land is covered with several varieties of dense low forests of acacia (*A. homalophylla*, *A. harpophylla*) and other varieties of "scrubs," as they are locally called. Where these occur they impart to the landscape a most agreeable and picturesque aspect, whilst the umbrageous protection they afford from the solar rays renders their presence everywhere welcome. The soils are generally black, sandy, and brown loam, varying in depth from a few inches to 10 feet or more. They are eminently adapted for fruit-growing and agriculture, as well as for grazing purposes.

Geology.

It speaks well for the organization and assiduous labours of geological survey when we are thus enabled, at so early a stage in the history of the colony, to deal with the geological structure of so large a territory. The rich mineral deposits that were early known to the pioneer colonists, who spent most of their time in prospecting the older rocks and alluvial areas of the country, have in no small measure contributed to the success of our investigations in this branch of human knowledge. The goldfields alone have tempted men to undergo hardships, privation, and even death in their attempts to penetrate the

most remote and barren regions of the colony in search of wealth, and the miners' footsteps have been closely followed by the officers of the geological survey, whose duty it was to bring to light and elucidate the great truths hidden beneath the surface.

The geological structure of the eastern or Pacific seaboard district of Queensland, representing broadly about a third of the colony and probably one of the oldest regions of the globe, consists chiefly of a series of ancient stratified rocks of Palæozoic age, the older members of which are more or less metamorphosed. There also occur granite and syenite rocks of plutonic and of metamorphic origin, as well as bedded and intrusive basic igneous ones, of various a es. The fossili-

QUEENSLAND. BLACK SWAN LAGOON, CANNING DOWNS.

ferous formations that also occur amongst these ancient rocks are Palæozoic, Mesozoic, Tertiary, post-Tertiary, and Recent. In their distribution they are associated with beds designated locally the Burdekin, the Gympie, Star, and Lower, Middle, and Upper Bowen, the Burrum and Ipswich, the Rolling Downs and Desert Sandstone, and the Lower and Upper Volcanic series, with associated drifts.

It seems very probable that at some remote geological period, the eastern edge of this portion of the country extended as far seaward as the present outer fringe of the Great Barrier reef. At this time the district represented one of the ancient tableland regions that constituted a striking feature in the physical structure of the Earth's

crust, before being modified by the natural process of denudation and other causes, which for ages have operated and continue to operate on the exposed surface of the rocks and soils. But although no longer possessing the distinctive features of a tableland region, there still remain the dominant areas of elevation that culminate in the peaks of the Great Dividing range, the coast range, and the loftier crowns of the Bartle Frere and the Bellenden-Ker mountains. Associated with these physical conditions are numerous detached hills and mountain masses, with broad intervening valleys and alluvial plains, traversed by many streams, the whole region being abundantly watered by a plentiful rainfall. The coastal waters here are dotted with islands that have been detached from the mainland by the natural agencies which have shaped the district, greatly diminishing its area by an immense belt corresponding in extent to the Great Barrier reef and lateral formations. The mineral areas of the colony are mostly located within the district now under consideration, and the natural resources here have in consequence been developed to a far greater extent than elsewhere.

The physical and geological structure of the western portion of Queensland is of an entirely different type from that which occurs in the east. Here there is a gentle and almost imperceptible surface slope from the main ridge westwards to the great central depression of the continent, the Carpentarian gulf, and the basin of the Darling in New South Wales. The rivers are mostly shallow, with broad and ill-defined channels, often dry in parts during times of drought. The scrubs and other types of stunted timber-trees, to which I have already alluded, take the place of the magnificent forests and luxuriant vegetation of the coast region. There is, however, a great variety of nutritious grasses and herbage, consequently the district is one of the very best for pastoral purposes, notwithstanding the somewhat scanty and uncertain rainfall, as compared with other parts of the country. But, luckily for the pastoralists, the operations of the well-borer's drill are frequently met with, and numerous overflowing artesian wells are scattered far and wide over a very large area of the territory. Most of the western district of Queensland, and very probably a great portion of the interior of South Australia, are covered by the water-bearing beds of the Lower Cretaceous formation. These are evidently developed over the whole of the rolling downs country, and consist of the soft stratified rocks upon which the widely distributed Desert Sandstone or Upper Cretaceous formation rests unconformably. There is reason for believing that this Desert Sandstone must at one time have covered fully three-fourths of the colony. It is a rock of exceedingly soft texture, and has in consequence been so extensively denuded that it now only occurs as isolated tablelands, supporting a very scanty vegetation, locally known as spinifex grass, and poorly developed timber.

QUEENSLAND. EMU VALE WATERFALL.

Here in this formation of the Upper Cretaceous strata are the Opal deposits, that lie embedded in the Desert Sandstone, where they have been found distributed over a wide local area. Opals occur in great abundance south of the town of Winton, in the Opal range, as well as along the tableland which separates the waters of the Diamantina and Mayne rivers. The Lower Cretaceous beds of this western division are associated with a formation of soft grey friable sandstone grits and conglomerates, now known to local geologists as Blythesdale Braystone, in consequence of its highly porous and absorbent structure, rendering it similar to the rocks of that well-known place called Blythesdale. Cropping out over a wide area of probably more than 5000 square miles of territory, it greedily absorbs the rainfall, and in this way acts as a feeder of the underlying water-bearing beds, whence the valuable artesian water-supply of the colony is supposed to be derived. The source, the extent, and ultimate destination of the artesian waters of Australia have long been a widely discussed subject. Until the recent investigations of the Geological Survey of Queensland set the matter at rest, it was generally believed that the artesian water-supply emanated from a source far outside the limits of the continent, probably in the lofty mountain regions of India or New Guinea, and geologists clung to this erroneous idea for years. It never occurred to any of them to seek for a solution of the problem nearer home. Then there is the question of destination to be considered, and this is still disputed. There are those who advocate the submarine leakage theory, based upon the assumption that an outcrop of the water-bearing strata occurs beneath the sea, thus affording an outlet for the accumulated waters absorbed by the porous intake beds of the Blythesdale rocks, on the higher levels of the Lower Cretaceous country, representing most of far western Queensland. My own observations and experience have, however, convinced me that the theory lacks confirmation and support in the light of our present knowledge. Considered from a geographical standpoint, the idea is most improbable, seeing that the whole central depression of Australia is almost entirely circumscribed by a ring of impervious Palæozoic rocks, rendering the escape of water from the retaining Lower Cretaceous beds of the inner basin impossible.

As I have already dealt with this quite recently in a somewhat lengthy paper contributed to the Royal Geographical Society of Australasia, Queensland, and published by that body,* nothing further need be said here except to add that the recent discovery of an immense subterranean supply of excellent fresh water stored in an enormous basin north of the head of the Great Australian bight, furnishes the

* "The Climate and Artesian Waters of Australia," *Queensland Geographical Journal*, New Series, vol. xvii. pp. 1–32.

weightiest possible evidence in support of the view which I have always expressed—that there is no extensive submarine leakage of the waters of Australia. And no other conclusion is possible if considered from a geographical standpoint.

In the north-west corner of the colony there occurs a development of Palæozoic rocks, which runs west into South Australia. From its eastern rim or apex, which coincides roughly with the 141st meridian, this ancient formation spreads itself out towards the north-west and south-east, crossing the western boundary of the country between the parallels of 24° and a little north of 17°. It is believed that these impermeable rocks are covered by the water-bearing beds of

BULLOCK TEAM WITH PINE LOGS ON RANGE AT CROHAMHURST.

the Lower Cretaceous formation, but there is no satisfactory evidence in support of this view, which can only be regarded as tentative in the light of our present knowledge. It is somewhat significant that no true artesian water has yet been discovered within the area in question.

The fossil drifts, or post-Tertiary deposits of Western Queensland have yielded abundant evidence to show that at one time in the geological history of the colony this district was occupied by several remarkable types of gigantic animals, of which the fossil bones of the huge semi-wombat (*Diprotodon Australis*), the marsupial lion (*Thylacoleo carnifex*), the gigantic kangaroo (*Macropus titan*), the wombat (*Phascolomys*), the *Nototherium*, the alligator (*Palimnarchus*

pollens), the moa (*Dinornis Queenslandiæ*), and many other remarkable forms of life of a bygone age, are the only remaining traces to be found. The molluscan fauna of the period in which these gigantic animals abounded, as revealed to us by the numerous fossil bones exhumed from the post-Pliocene drifts, shows clearly enough that in post-Tertiary times there occurred in western Queensland, and over a vast area of central Australia, great marshes, extensive lakes, and broad streams, the whole physical conditions of the region indicating an enormous rainfall and an excessively moist, hot climate, highly favourable for the development of a rank and luxuriant vegetation, upon which the vigorous faunal types of the age flourished. The local extinction of the pre-historic fauna was no doubt accomplished by the great climatic and physical changes that occurred over the whole of the region now under consideration.

Mineral Wealth.

Queensland is the third gold-producing colony of Australasia, although the mineral industry has not yet advanced beyond the experimental stages, except in a few settled localities, where auriferous mining is now being carried on upon a somewhat elaborate scale. Several well-known gold-bearing areas are wholly undeveloped, and many extensive tracts within known metalliferous belts of country have not yet been prospected. At present there are altogether sixty-nine proclaimed goldfields, besides sixteen mining districts. These are distributed over an enormous coastal region, extending throughout the eastern district, from the southern boundary of the colony to the far north, in Cape York peninsula. There is reason to believe that the mineral wealth of the country is enormous. Vast areas are yet unexamined, and untold treasures may await discovery. The gold-mining industry is divided into two very distinct branches—alluvial and quartz, each great in itself. During 1901 there were employed in these 9438 miners, made up of 7340 quartz and 2098 alluvial miners. The yield of gold for the year following was 860,453 oz., and the total yield to 1902 from auriferous quartz and alluvial deposits was 16,532,434 oz., equal in value to £55,472,314.

Besides gold, other valuable minerals occur in many parts of the colony. These include copper, silver, antimony, and tin ores; coal, opal, gems, bismuth, wolfram, manganese, and lead. The quantity of these raised from 1860 to the end of 1902 represents a total value of £11,463,961. This latter amount added to the former gives a grand total of £66,936,275, which represents the acquired mineral wealth of the country since separation from the mother-colony. The value of the gold and other minerals extracted from the rocks and soils of Queensland for the year 1902 was £3,310,600. Considerable as this sum may appear—and indeed is—each individual member of the entire

population of the colony would only receive a trifle over £6 were it divided equally among them.

Owing to the very low market value of the metal, the *copper-mining* industry receives but very little attention at present, although the ore occurs in enormous deposits in parts of the territory, especially in the northern districts, where large masses of pure virgin copper are met with. Some of these are of enormous size. In one locality, on the eastern coast-line, the outcrop of copper ore resembles the rugged cap of a sharp-peaked mountain, with pinnacle-like points projecting far above and over the narrow base, the appearance of the

PAUL BEK'S VINEYARD, QUEENSLAND.

great dentiferous pile being remarkably striking when seen from a good position.

The well-known Ipswich Upper Trias beds have yielded an immense quantity of coal since they were first opened up by the enterprising companies now engaged in this important industry. The actual quantity of coal raised in the state from 1860 to the end of 1901 was 6,695,523 tons, valued at £2,821,989. Most of this has been obtained from the Ipswich coal-measures, which are developed over an area of some 12,000 square miles. Coal-seams are known to exist in other localities, but the Burrum river outcrop of true Palæozoic coal is admitted to be the most important of all. It lies about 15 miles north-west of the town of Maryborough, where several workable seams

appear on the river-bank. The coal is excellent, its quality being equal to that of the famous coal of Newcastle, New South Wales. There can be no reasonable doubt whatever that a most profitable industry could easily be established in the development of this coal-field.

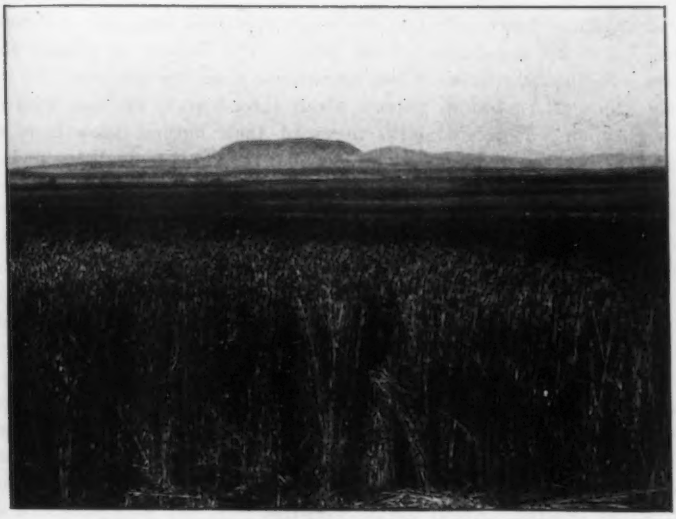
Briefly, the position may be summed up thus: The coal-beds are immense; they are largely developed in the eastern district along the coast-line, in localities easily accessible by rail or by water. All of the outcropping seams may be wrought at a very low cost; most of the coal is of the very best quality, and there is every facility for transporting it to the principal eastern seaport towns, from Cooktown to Brisbane. Not only could the bunkers of the entire fleet of steamers now trading to Queensland ports be always stocked with coal from the colony, but large quantities could be exported after providing for local consumption. Building-stones form another valuable asset, the importance of which is hardly yet realized, marble, granite, and sandstone of an excellent description occurring over a very wide range in Queensland.

Other Products.

Queensland is remarkably rich in vegetable products that flourish naturally under the congenial influence of a fine climate and soil. They are reliable indications of the geographical and geological conditions of the colony, as well as of the character of its climates and its soils. They differ in some important particulars from the natural products of the southern portion of continental Australia, in that they include many distinctive tropical types, which are not met with in extra-tropical regions, nor in the alpine zones of higher latitudes. In fact, the flora of the country possesses many Asiatic forms, and this feature is strongly marked in the eastern tropical district, where numerous Indian types are distributed over a wide geographical range. The *Pandanus* tree, which ranges to New Guinea, the South Pacific islands, and north to India, flourishes all along the Queensland coast, extending into the northern portion of New South Wales, where it intermingles with the vegetation of that country. The coastal fringe also includes in its vegetation other Indian types, the *Pandani* and the mangroves being, however, prominent, whilst the Asiatic forms still reveal their identity for some distance inland, where the leafy brush-wood and cedar trees are met with. The Indian bamboo is rarely found in natural growth, but orchids are by no means uncommon in the rich tropical scrubs and forests of the north. It is, however, the prevailing *Eucalypti*, the *Acaciæ*, and other less pronounced forms peculiar to Australia, that give the vegetation of the colony its distinctive character. In favourable localities, the dense scrubs of the eastern district of Queensland surpass all other natural products

in luxuriance. They develop enormously in the moist heat and rich soils of the coastal region.

The vegetation of the country has yielded an abundant harvest; already the number of species discovered is remarkably large. The *Phanerogamia* comprise 1366 genera, 3752 species, 275 varieties, and over 200 naturalized plants; the *Cryptogamia*, 449 genera, 1467 species, and 72 varieties. Although these include several plants that likewise flourish in India, the Malay archipelago, and New Guinea, it may be remarked that no typical Australian plants are met with in India. This community of vegetation alone indicates that probably these countries were formerly united, and, furthermore, that the typical



QUEENSLAND. WHEATFIELD, CANNING DOWNS, NEAR WARWICK.

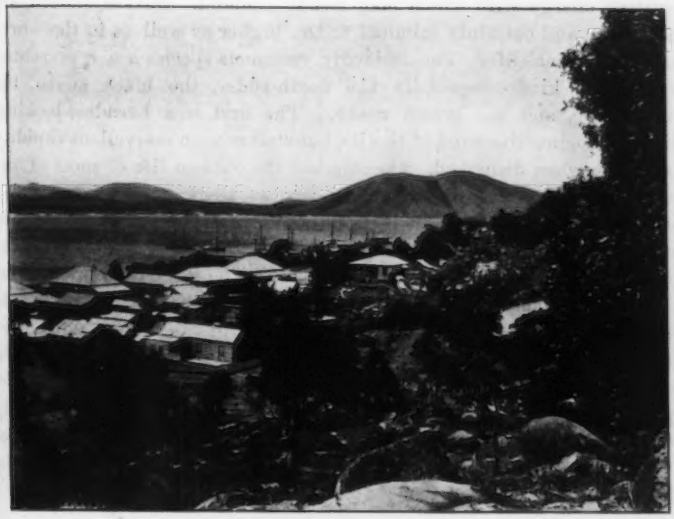
Australian plants were either developed after the separation of the country from Asia, or that there existed a distinctive Austral flora, distributed over a region whose limit did not extend farther north than probably the equator.

The forests and scrubs yield a great variety of valuable timbers, eminently suitable for the capricious requirements of man. These are used extensively for cabinet-making, ship-building, bridge-building, railway purposes, street-paving, house-building, and so forth. At the Melbourne Centennial International Exhibition of 1888 there were exhibited over five hundred varieties of Queensland wood, and it was estimated by the Colonial Botanist at the time that these represented

"probably little more than one-half of what might be collected in Queensland, . . . for no country in the world has a greater variety of useful and beautiful woods." Unhappily, some of the splendid forest areas of the colony have been denuded of a great deal of their valuable timber trees, and until lately no properly organized steps have been taken to arrest the destruction of the state forests. Timber-getters, by paying a licence to the Crown, have been at liberty to fell the choicest monarchs of the forest, carrying off the pick of the timbers, and throwing aside all else to rot and go to waste, at the same time taking no heed to make good by planting that which had been destroyed by the axe. The whole timber industry in the past may be said to have been characterized by this improvident feature. It is to be hoped, however, that this destructive system will not continue operative any longer now that the newly appointed Inspector of Forests has taken up the duties of the office. The variety of grasses and economic plants, too, is not less remarkable than the timbers. Of the 360 kinds of Australian grasses, about three-fourths are met with in Queensland. Associated with these, in their natural growth, is an esculent herbage of highly nutritious quality, and it is doubtless owing to the natural commingling of these diminutive forms of vegetation that the famous pastoral resources of the country are everywhere unsurpassed. Most of the grasses possess phenomenal vitality, and even when apparently annihilated by crushing droughts, they shoot forth luxuriantly after a shower of rain. The economic natural resources, although full of promise, have not yet been fully utilized. There has been little or no attempt to develop them effectively, and this is no doubt owing to the greater attention bestowed upon other more tempting industries. All kinds of tropical and extra-tropical fruits grow abundantly in the wild state and under cultivation. Vegetable oils of commerce are met with everywhere, and fibrous plants are numerous, many of the fibres manufactured from the latter being of excellent quality. About eighty varieties from the neighbourhood of Brisbane have been successfully treated by the late Mr. M'Pherson, who obtained the highest awards for them at international exhibitions in Australia and elsewhere. They are very fine in texture, and it would pay handsomely to establish an industry for their manufacture. There is a splendid opening in Queensland for the manufacture of vegetable oils, especially the essential oils of the *Eucalypti*, of which several varieties are met with. There are altogether about 360 known economic plants in the colony, of which some 130 have been introduced.

The descent of many of the extinct animals of the *Nototherium* period is continued in the present one. The gigantic kangaroo, the native bear, opossum, native cat, dugong, dingo, lizards, alligators, and other species of prehistoric times, are fully represented by the smaller types of the present Although it cannot be said that there

are any very clearly defined faunal regions in Queensland, betwixt which approximate lines of demarcation could be established, yet there are, as a matter of fact, certain recognized zones contingent upon the climatic and physical conditions of the country, to which a limited number of animals are restricted. This is especially the case with the kangaroo, restricted in its range to the comparatively open downs country and to the thinly timbered coastal regions south of Townsville; the cassowary, whose home is in the scrubs of the northern district; the crocodiles, that inhabit the tropical rivers of the coast, and other less important forms of circumscribed geographical range. The remarkable Burnett salmon, known as *Ceratodus Forsteri*, is found



COOKTOWN, QUEENSLAND.

nowhere outside the Burnett river. It belongs to the rare family of Dipnoids, the only other known species being met with in the Amazon and in Africa.

Birds are both numerous in species and beautiful in diversity of colour. The rich and dense tropical scrubs and luxuriantly thick forests of northern Queensland favour a much greater variety of bird-life than is met with in any other part of Australia. Nowhere, except in New Guinea and in the famous forests of Brazil, is the avifauna of the country surpassed, or equalled, in variety of species and in wealth of beauty. Several of these distinctive tropical forms possess many characteristic features peculiar to some of the Papuan birds of the

Paradise family, particularly the *Manucodia*, *Chlamydodera*, and *Ptilorhis*. The cassowary of North Queensland finds a counterpart in the New Guinea species, and one of the kingfishers is common to both countries. Parrots and pigeons are abundantly represented in the whole of Australia, and they too are allied to the Papuan and Moluccan types. The remarkable mound-builders, the scrub turkey and northern scrub hen (*Megapodius tumulus*), are plentiful in many parts of the colony; the former is a bird peculiar to Australia, the latter is also met with in New Guinea and the Malay archipelago.

Reptilian life is well sustained throughout the entire territorial area of the colony. It is one of the worst manifestations of Nature's creative energy with which man has to contend. Snakes, indeed, are numerous, and certainly inimical to the higher as well as to the lower forms of animal-life. The decidedly venomous species are represented by several kinds—especially the death-adder, the black snake, the tiger-snake, and the brown snake. The first is a harmless-looking, diminutive, inactive kind of reptile, but strikes with marvellous rapidity and force when disturbed. Considering the outdoor life of most of the colonists—in the forests, scrubs, and plains—the mortality from snake-bite is remarkably low. Many of the northern streams are infested with crocodiles, but these dangerous saurians are not found in the rivers of southern and western Queensland. The large crocodile attains a length of some 24 feet. It is stealthy in habit when seeking to seize its prey, and strikes with terrible and relentless force with jaws and tail as well. Queensland is also rich in reptiles as well as in butterflies and other forms of insect-life. Both *Ornithoptera* and *Coleoptera* are very plentiful, the rich tropical vegetation being especially favourable to the development of an apparently bewildering number of species and varieties. The rich colours are very beautiful, and the size striking.

Climate.

The climate of Queensland has rarely been justly estimated. As a matter of fact, the climate of the southern portion of the colony is unrivalled. Extremes of temperature are unknown. The summer temperature is warm, but rarely oppressively hot; in mountainous regions and on tablelands of even moderate elevation, it is decidedly cool, temperate, and bracing. The winter climate of this part of the country resembles that of Naples. There is a prevailing cloudless sky; the atmosphere is clear, dry, and invigorating; the nights are comfortably cool, and the days delightfully warm. Frosts are very slight, and of only a few hours' duration. This season is most conducive to health and congenial to outdoor life. The distressing hot winds, so frequently experienced in other southern colonies, are unknown here. The humidity is naturally greater in the coastal district than in the inland regions,

where the air of the great western plains and rolling downs country is exceedingly dry and buoyant. The moist heat of the coastal belt is greatly modified by the refreshing sea-breezes and prevailing trade-winds. On the slopes and spurs of the coast range the temperature is comparatively low, and the air clear and bracing, whilst the atmosphere of the Herberton tableland is remarkably salubrious, keen, and refreshing. Persistent and irritating miasmatic disorders are entirely unknown in this elevated region, where the nights are frequently cold and frosts by no means uncommon. West of the coast range the temperature is sometimes high during the summer months, but it is a dry heat, and very little inconvenience or discomfort is experienced by

TORRES STRAITS. NATIVE CONSTABULARY AT DARU (UNDRESS).

Europeans engaged in mining and other laborious occupations. Taken on the whole, it may be honestly stated that outside the tropic the climate of the country is highly favourable to the European constitution. Queensland is thus partitioned into two distinct and well-defined pluvial zones, that correspond with the dominating climatic ones in a very marked degree. The eastern or coastal division is abundantly watered by a copious rainfall; the vegetation is in consequence luxuriant, and the soils exceedingly fertile. In the western district the mean annual rainfall is generally scanty, and not infrequently deficient in places. It gradually diminishes from about 47 inches at Toowoomba, on the top of the main range, to about 6 inches at Birdsville; and at

Camooweal, within the tropics, and almost due north from the latter place, it is about 15 inches only. The natural effect of this minimum precipitation is everywhere felt in the extreme dryness of the climate, and this would indeed have rendered the pastoral occupation of some far west and remote areas altogether impracticable were it not for the valuable artesian waters with which they are now abundantly supplied. Since artesian water was first discovered in the storage beds of the Lower Cretaceous formation, which is estimated to represent 56 per cent. of the entire area of the colony, the borer's drill has pierced the rolling downs strata in all directions, and the result has been a complete transformation of parts of the country from their former dry and parched state to a happy condition of fertility. Taken altogether as officially catalogued, there are now over 934 bored wells in Queensland, most of which are west of the coast range, the daily average for each bore being 666,231 gallons, while there are several bores whose daily yield is from three to four millions of gallons apiece, and much of the water is suitable for irrigation purposes. Besides the bores, there are numerous natural artesian springs that yield a very large supply of good water, and these appear to occupy a belt of country between which and the central region of the continent there is probably some well-established connection, as they correspond in their peculiar characteristics with the thermal springs observed by travellers in that part of the country.

The temperature records of the colony are now well established. They very clearly indicate, by their maximum and minimum isothermic lines, that the heat is very rarely abnormal in any part; that there is, in point of fact, an agreeable uniformity in the thermometric range throughout the year. At Brisbane the mean shade temperature is 68°, at Roma 65°, Rockhampton 72°, Townsville 75°, and at Hughenden 74°. The wet season occurs in the months of December, January, and February, during which time thunder-showers are frequently experienced, and the rivers sometimes flooded. In consequence of a recent very serious and prolonged drought, much attention is now being given to irrigation and water conservation, not only there, but in other states of the commonwealth. Already some extensive schemes have been developed in the Murray basin by the New South Wales Government, and in Victoria and South Australia irrigation operations have been in progress for some time. But there is much doubt whether these will pay. In point of fact they have not done so to any extent as yet. Still, there is a vast future before the country, and irrigation in the coastal districts will certainly be developed on a sufficiently large scale to adequately meet the requirements of closer settlement, when the results are certain to be more satisfactory and the conditions of life correspondingly favourable. With water-conservation the case is quite different. It is now very fully recognized that a mistake has

been made in allowing the whole of the copious rainfall to run to waste in the sea, when a portion of it could have been stored up to make provision for dry times. With this object in view, it is proposed to examine the watercourses systematically, and explore the catchment areas. In consequence of their comparative shortness, some of the coastal watercourses have rather steep declivities, and the channels are not impervious, both of which conditions are unfavourable to the storage of large quantities of water, and consequently the subject is one associated with some difficulties. In the Moreton district, for instance, this is especially the case. Here a system of reservoirs for water-impounding has been proposed. But no practical results have ever been obtained from the scheme, which to all intents and purposes has been abandoned. But in the sugar districts north of Brisbane, especially at Bundaberg and in the Burdekin delta, a good deal of the river waters is utilized for irrigating the fertile lands there, and the experiment has so far been satisfactory enough to induce the settlers to give the matter some considerable attention.

Industries.

As a wealth-producing colony, Queensland occupies a position in the front ranks of the British Empire. Its commercial and maritime position is one of the most important in the southern hemisphere, being the key of the great ocean. It possesses some of the finest natural harbours to be found on the whole of the Australian continent, and an enormous stretch of over 1200 miles of the coast-line is protected from exposure to the Pacific ocean by a stupendous barrier reef of coral rocks, with its inexhaustible products of pearl shell and fishery, including *beche de mer* and tortoise-shell, whilst the favourable advantages it affords to all classes of shipping in navigating the coastal waters of the territory cannot be overlooked. Viewed from a national or territorial standpoint, the population of the state is absurdly small. It must indeed be obvious to all concerned that the full development of the great revenue-producing resources cannot be accomplished by the mere handful of some 510,515 people that now inhabit the country, the great majority of whom are urban dwellers. It is only by the substantial increase of the rural inhabitants that the latent wealth can be rendered productive. The comparatively small number of colonists may, however, allude with some satisfaction to the annual export trade, now amounting to over ten million pounds sterling. This is a very satisfactory record of progress, and affords striking evidence of the industry and enterprise of the people, who, in the face of numerous pioneering obstacles, and the drawbacks of early settlement, are loyally endeavouring to extend the British Empire in this fair land. The industrial resources of Queensland have drawn to its shores people of divers nationalities, who contribute to their development. Besides Britishers and other Europeans, there

are Americans, Chinese, Japanese, Indians, Siamese, and Polynesians. The Pacific Islanders, or Kanakes as they are commonly called, are chiefly employed as labourers in the sugar industry, for which occupation they are eminently suited. For well-known scientific reasons, the white man is not fit to take the place of the Kanaka or Polynesian worker in the cane-fields of Queensland. It is a generally recognized fact that white people who live in the tropics become anæmic, and suffer more or less from malaria, the former disease resulting from a diminished supply of oxygen in the air, which by expansion becomes rarer in the high temperature of the tropical regions than in the temperate zone. Thus we see from actual experience, and as the result of scientific investigation, that the tropical cane-fields are inimical to Europeans, who, in consequence, cannot hope to ever compete with the natives of the tropics in cane-culture there.

The public debt of Queensland, amounting in all to £36,898,414, is really comparatively small for a state whose immense resources and vast natural wealth are beyond estimation, and has been almost entirely spent on railways, reproductive works, and immigration. Although some 2801 miles of railways are now opened for traffic, it is obvious that these pulsating arteries of commerce will have to be greatly extended over the country as territorial settlement increases. It will, no doubt, be found necessary to tap the northern portion of the state by a grand trunk-line of railway, extending to the shores of the Gulf of Carpentaria. This would place the capital city of Brisbane in closer touch with London and the great Eastern markets of India, China, and Japan, and would, moreover, help greatly to open up the unsettled districts of the country. As it is, the great interstate railway connects Brisbane with Sydney, Melbourne, and Adelaide on the south ; Gympie, Maryborough, and Gladstone on the north; whilst Dalby, Roma, Charleville, and Cunnamulla in the far south-western division are also linked by rail to the capital city of the state. In the central and northern districts, the vast pastoral areas of the far west are pierced by the iron roads that connect the remote township of Longreach, on the Thomson river, with the important seaport town of Rockhampton; Hughenden, on the headwater of the Flinders river, with Townsville.

The principal products of the colony are derived from three great primary sources—pastoral, mineral, and agricultural. The first of these is more fully developed than the others. It was, in fact, the parent industry, the foundation of which was laid by the early pioneers, who pushed northwards with flocks and herds from the mother-colony, in search of fresh pastures.

In the early days, even it was known that the vegetation and climate of the great western district are eminently suitable for stock-raising, and large areas are now occupied for this purpose. Alth ough cattle and sheep have been, and are now to some extent, pastured on

the lands of the coastal region, the number is small compared with the great flocks and herds that have flourished on the famous pastoral lands of the rolling downs. It is, however, anticipated, that instead of being mostly used for grazing purposes, the rich and fertile lands of the Darling downs will in future be utilized for the production of grain, for which they are unrivalled.

In ordinary seasons, when not handicapped by serious droughts, the sheep, cattle, and horses in Queensland number some scores of millions. The wool, meats, and other by-products find a place in the world's markets, but the further development of this industry is greatly hindered by the difficulty sometimes experienced in readily placing the

NATIVES OF BADU-MULGRAVE ON ROCKS AT GREENWALL.

beef and mutton upon the European market. Both of these products are acknowledged to be of excellent quality; the supply is practically inexhaustible, and the cost very low. There is no reason whatever why the meat-consumers of the United Kingdom should not obtain their supply from Queensland. The question of transport is one that need no longer render this impracticable, since the ordinary passage to England is now so comparatively short that weekly supplies may be landed in London with unfailing regularity. The needed encouragement would thus be not long wanting were the very high qualities of the meat fully appreciated.

The agricultural industry is limited to the eastern settled district, from Cooktown south. There is a broad coastal belt, south of the

22nd parallel, highly favourable to the cultivation of maize; the rainfall is more than 20 inches during the summer months, which is the rainy season there, and the soils are exceedingly fertile. Since the discovery of large supplies of artesian water, extensive areas of country have thereby been rendered suitable for agriculture that were formerly of no value for that purpose. This is especially the case with the rich pastoral lands of the west to which I have already alluded, where the climate and soil render them of immense value for the production of grain. It is no exaggeration whatever to state that in no other part of the world—and this cannot be too often reiterated—has nature provided a more suitable region for the grain-cultivator than the one under consideration, the only drawback being the occasional occurrence of droughts. It is, however, anticipated that this obstacle to closer and more rapid settlement will shortly be overcome by a well-developed scheme for conserving the rainfall and natural waters of the country. The whole of the agricultural forms in the state represent an aggregate area of about 26,288 square miles (including lands alienated by deeds of grant, lands sold by auction, and selected); some 714 square miles are under cultivation, including an area of 170 square miles under sugar-cane. The sugar industry is one of very great importance, and its bearing upon the present and future prosperity of the country can scarcely be overestimated. The sugar lands at present under cultivation chiefly comprise the rich alluvial areas of the coastal region, especially in the Mackay and Bundaberg districts, where large mills with elaborate appliances have been established at very great cost. The annual output of sugar reaches a value of close upon a million pounds sterling.

Land in Queensland may be easily and readily acquired from the Government on terms and in areas liberal enough to place it within the reach of all.

Tobacco grows to perfection in the Stanthorpe and Killarney districts, and it is locally manufactured to some extent, the quality and flavour of the weed being greatly appreciated by consumers. Coffee is cultivated in the northern district, east of the main range, where the soil and the climate are especially favourable to the growth of the plant. Cotton and arrowroot find congenial fields in the rich lands of the southern district, on the eastern side of the main range. Fruit-growing is an industry that has hitherto received very little attention, but for the extension of which there is great scope; while the ramifications of the pearl-shell industry extend over the numerous shallow submarine areas of Torres Strait, within the Great Barrier reef. Thursday island is the capital of the pearl fleet, and it is also the neutral camping-ground of a mixed population from all quarters of the globe, who are mostly engaged in pearl-fishing. The industry is an important one to the colony, and special legislative measures have had to be enacted for its proper regulation. Over 1250 tons of

pearl-shell were exported during the year 1900, valued at £128,451. This sum does not include the amount realized for the many valuable pearls that have been found in the shells. Divers are employed to search for the pearl-shell in depths up to 20 fathoms, beyond which they cannot work without danger to life.

To the enterprising colonist, Queensland offers a very wide field for the establishment of industries, or for the further development of existing ones. Many of the goldfields only require the judicious investment of capital to develop them into profitable and permanent industries that would yield very handsome returns. The meat industry is yet in the experimental stage, so to speak, and to its future possibilities there is practically no limit. No systematic steps have yet been taken to supply the local markets with fish, although the coastal waters teem with fish of excellent quality. The agricultural industry and its associated branches, offer an unlimited field for the profitable investment of small capital, and the remunerative employment of agriculturists with very moderate means and practical experience. Irrigation has only yet been attempted on a very small scale, operations being chiefly confined to the lands of the lower Burdekin basin. The artificial watering of the lands will, no doubt, receive early attention in the western parts of the colony, now that artesian supplies of water have been obtained in country where formerly irrigation was impracticable. It is not possible to give even an approximate estimate of the areas of lands suitable for irrigating, but, broadly speaking, it may be said that probably the whole, or most, of the vast rolling downs country is naturally adapted for that purpose.

CHANGES IN THE LEVEL OF THE CITY OF NAPLES.

By R. T. GÜNTHER.

The evidence for the changes of level of the coast of the Bay of Naples since the Roman times * is supplemented and confirmed by the evidence of alterations in the level of the city itself, but as most of those who have recorded this evidence have failed to realize the full extent of the land-movements, their descriptions are incomplete, involved, and often contradictory. In no case is this more clear than in histories of the Port of Naples.

It has often been affirmed that the ancient harbour of Naples was much further inland than the sea reaches now, being situated below the

* Some account of the evidence for the changes of level of the Italian coast has been given in this *Journal* for August and September, 1903, and in *Archæologia*, vol. lviii. *Cf.* 'Contributions to the Study of Earth Movements in the Bay of Naples.' Oxford. 4to. 1904.

churches of the Gesù Vecchio and S. Giovanni Maggiore ;* and opposite the *gradinata* (steps) leading to the latter church have been found ruins supposed to be of a lighthouse, which was built of good tile-bricks and contained a marble spiral staircase.† On the site of the Collegio del Salvatore a wall was found of great blocks of lava like that from Monte Olibano, laid without any mortar; according to the account given by Sponzilli, this wall was considered to be part of the mole of the Greek Parthenope.‡

According to some accounts, the earliest harbour became filled up and was succeeded by another near the church of S. Onofrio, where a street, the Vico Lanterna Vecchia, was named after the light of the Port. The second harbour was similarly succeeded by a third, constructed by Charles II. of Anjou (1285-1309), which is still in existence inside the mole, called the Molo Piccolo, now part of the Via Piliero. Charles II. subsequently began building the mole of a larger harbour outside, which was finished by his successor, and received the name of the Molo Angioino.

The quarter of the town which is said to have arisen upon the site of the two most ancient harbours rests on a subsoil of sand and marine deposits, and has received the name Porto. Were this the only evidence before us, we should be justified in assuming the remains of the ancient harbour of Neapolis to be as far inland as S. Giovanni Maggiore, but our assumption is shaken by the occurrence of Roman ruins, below sea-level, in the very quarter supposed to have been under water. To mention but a few of the localities where such remains have been discovered in excavations at a very low level, we may cite the Strade Ferrivecchi and Armieri (Loffredo, c. 29); in the Strada dei Pellettieri near S. Paolo was found the marble gateway which was put into the chapel of the old Royal Palace near the Arsenal (Summonte, i. 27); under the present Arsenal, tombs and the walls of porticoes and cisterns occurred at so low a level that Fabio Giordano thought that they must be the fish-ponds of Lucullus, which have also been identified with the low-lying remains under Chiatamone by Pontano and Celano; other ruins lie buried under S. Maria a Cappella on the Chiaia, and near the eastern end of the workshops of the dockyard was an "ancient bath" close upon 5 feet below water (Niccolini).§

* Founded on the site of a temple built by Hadrian and dedicated to Antinous.

† The ruin was standing until 1680, when it was stated to have been demolished to make way for the new buildings of the magnificent Refectory of the Collegio del Salvatore, now the "Aula Magna" of the University.

‡ In the author's opinion, Parthenope, if synonymous with Palæpolis, was not situated so close to Neapolis, but lay at the southern end of Posilipo (cf. *Archæologia*, vol. lviii.). The harbour referred to by Silius Italicus in the sentence "*Parthenopæ portus statio fidissima nautis*," cannot, therefore, be identified with certainty as the predecessor of the modern Port of Naples.

§ To this list of Roman ruins which have been unearthed at a very low level, we may add the following: *opus reticulatum*, Pennino dei Moccia (Carletti, p. 70); walls

With the knowledge that the land is now at a level much lower than that which the Romans knew, and also that a subsidence of some 35 feet, followed by an elevation of 19 feet, has taken place in the dark ages, we have, as it were, a key to the questions that puzzled and sometimes baffled the historians.

Since the Angevins there have been a succession of harbour extensions to seaward, and consequently the early writers assumed that the march of the coast had always been in that direction and that the first harbours were close under the old town walls. The contrary is likely to have been the case, for before the post-Roman subsidence of the land, the quarter of Porto must have been high and dry, and a harbour could not have been any nearer the town than the Porto Piccolo, but may have lain rather further out. The Roman foreshore would certainly have extended beyond the limits of the shore in the thirteenth century, which is known, for Charles of Anjou erected the church of S. Pietro Martire "on the edge of the water" (Nobile), and the beach extended to the Incoronata.

How, then, is the tradition of a lighthouse near S. Giovanni Maggiore to be reconciled with these facts? The answer is to be found in the subsidence of the land during the dark ages. With the land 19 feet below the present level, the quarter of Porto would have been under water, and the sea would have broken at the foot of the town walls. Then, no doubt, small vessels may have found shelter under the lee of partially submerged *muricini* or the secondary walls, which seem to have been constructed on the south side of the town, and a light placed upon an ancient tower may have marked the anchorage. We would, therefore, explain the so-called mole of large blocks of lava near the Gesù Vecchio, as being parts of the walls of Greek Neapolis, and the tile-built *pharus* as a Roman tower which in the dark ages was converted into a lighthouse. It is difficult to fix the exact date at which these land-movements were in progress. The subsidence is recorded in a passage in S. Gaudioso, Bishop of Salerno, who mentions a violent eruption of Vesuvius, accompanied by the submersion of a part of Naples by the sea, at some time during the fifth and sixth centuries. A rising of the land is recorded in the chronicle of Santa Sofia, for on July 12, 1212, the sea is stated to have retired for 75 yards; and on Sunday, May 6, 1237, the sea retired for a bowshot from Gaeta to Castellamare.

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built of tiles and a Greek inscription under the Case de' Benedettini near S. Severino (Martorelli, 'Theca,' p. 474); foundations of *opus lateritium* and *reticulatum*, and fragments of columns under the Chiesa di Portanova (Cestari, 'Top. di Nap.,' p. 13; Celano, iv. 52); bases of columns and pieces of an architrave, under the Sedile di Porto (Martorelli, 'Theca,' p. 636); bas-relief of Orion, fragment of architrave inscribed Cæsar, and two large marble cats (Lettieri)—the former has been put up against a wall in the quarter of Porto, and is vulgarly known as the Pesce Nicolo, after the noted swimmer who used to swim with letters from Messina to the mainland in the time of Frederick of Aragon.

We owe to Petrarch a description of another retreat of the sea, which was accompanied by a great tempest and earthquake, on November 25, 1343,* during his visit to Naples as Nunzio Apostolico to his Eminence the Cardinal Colonna.

Now, although the "retirements of the sea" which are recorded from the thirteenth and fourteenth centuries are best explained as incidents of the rising of the land, we do not believe that the whole uprising of 19 feet took place wholly within those centuries. The history of the church of S. Leonardo on the Chiaia, also known as S. Leonardo dell' Isola nella Villa reale, shows that no very considerable upheaval of land could have taken place after the foundation of the church in 1028, an opinion which is supported by the record of houses existing on the site of S. Pietro Martire in 1075 (Grimaldi), and by the fact that other lowlying quarters had been built upon in very early times, witness the Sopportico Gajolari, the Church of S. M. delle Rose, the Strada Costanzi, the Strada Calcara, and the Rione and Sedile Calcara. Confirmatory evidence might perhaps be also obtained from the Church of S. Giovanni a Mare, which is said to have been built upon the foundations of an ancient temple (Niccolini).

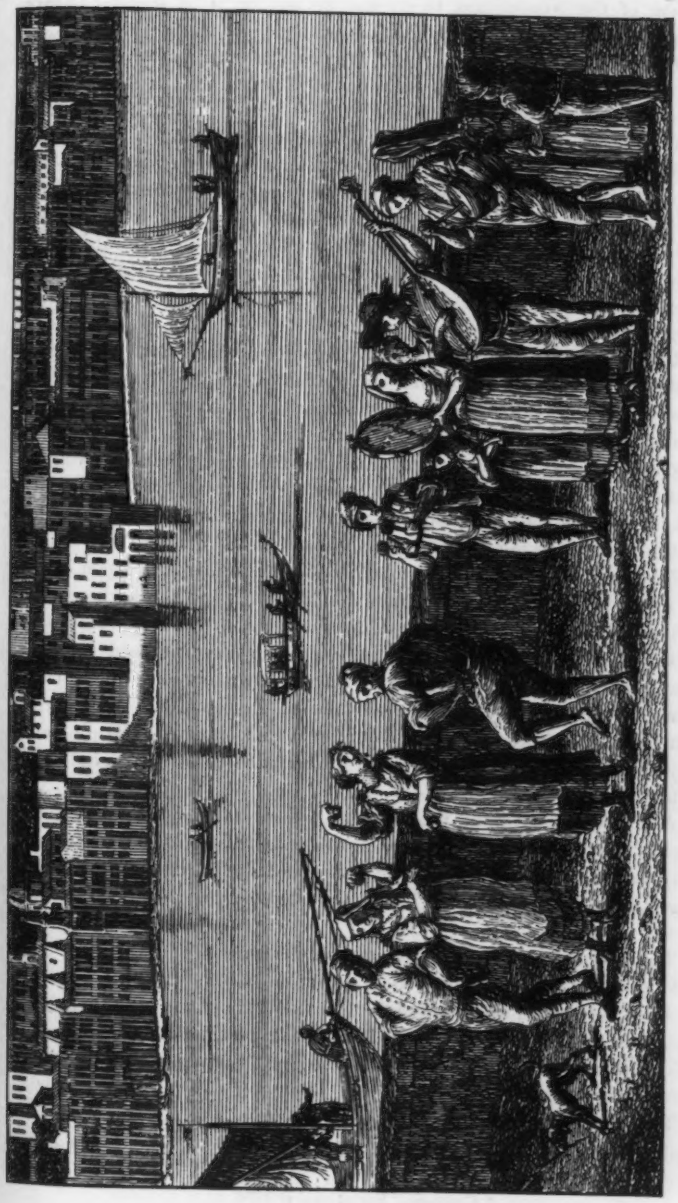
At the time of the greatest subsidence of the land, two islands lay just off the shore. The largest, a rock known as the *insula maris* or Megaris opposite the Castello Lucullano, is still in existence, although connected with the mainland by a causeway and bridge.† The Chiesa al Salvatore was erected upon it in the seventh century, it was strongly fortified by the Normans in the eleventh, and their masonry may still be seen under the walls of the Castel dell' Ovo as it now stands. A second church dedicated to S. Pietro was founded in 1324. A short distance to the east was the second islet, the small Isolotto di S. Vincenzo, not much above the sea-level, which belonged to the monks of S. Vincenzo al Volturno, having been given in 882 to Majone, their abbot, and is described as a property "in portu Neapolitano."‡ The Castel Nuovo now covers much of the property, but in the eleventh century the islet was still in existence, for in 1031 the monks of SS. Teodoro and Sebastiano litigated for rights of fishing in the sea around the islet. The next mention of it is probably dated after a considerable elevation of the land had taken place, for in 1280, the *isulilla* "sauda et destructa et dequastata et arida et sine hedificio" was given *in enfitensi* by the monastery§ to Raone de Griffo, a member of a rich family who lived near the port. In 1383 it came into the possession of Summo de Griffo by purchase from the Abbot of S. Sebastiano: at this time it was the

* The church of S. Pietro Martire is said to have been "buried in frightful floods" in this same year.

† The work of Zuniga, 1592.

‡ Chron. Volturnense ex Cod. Barberiniano, f. 149. v.

§ S. Sebastiano.



THE CHURCH OF S. LEONARDO (12) ON THE RIVIERA DI CHIAIA, NAPLES.

(From an engraving by A. Carlon, dated 1765, after the picture by Gabriele Ricciardelli, entitled "Veduta di Chiaia dalla parte di levante.")

custom of the Neapolitans to go and sit out on it in summer to take the air, and Charles II. is stated to have done so too.

In the fifteenth century, the Torre S. Vincenzo was erected in the sea, and it was found useful in some of Charles VIII.'s engagements with the Aragonese in 1495, and with the French and Spaniards in 1501. According to Capaccio, "e sia verso quel tempo" (*i.e.* about the time of the commencement of the works for the New Arsenal in 1577) "il mare ritornò indietro, e sia finalmente per la gran quantità di pietre e di terra, buttate nel mare circostato, l'isola spari e la torre, in certo modo restaurata resto nel continente." * The church fell into ruins. Charles III. (1740 circ.) used the tower as a prison for children who were disobedient to their parents, and it was probably demolished at about the end of the eighteenth century.

In conclusion, if our theory with regard to the historical sequence of the Earth-movements which have affected Naples be accepted, it follows that the real site of the Roman harbour of Neapolis has yet to be identified, and that it certainly lay much further south than is usually supposed. By a more or less gradual depression of the land-level, the classical foreshore became deeply submerged, until by the eleventh century the sea had reached a position not very unlike that indicated on the accompanying plan. The Isolotto di S. Vicenzo was then a well-defined island, the sea reached to the rising ground upon which the southern ramparts of the town were founded, and the harbours, the Portus Vulpulum and the Portus de Arcina, may have lain approximately in the positions shown. Niccolini seems to have claimed an even greater submergence of the land than ourselves, for one of his maps shows sea close under the eastern walls of the town, but the reported occurrence of buildings near the Mercato Vecchio and the Carmine at a very early date makes us hesitate to accept the coast-line as indicated by him.

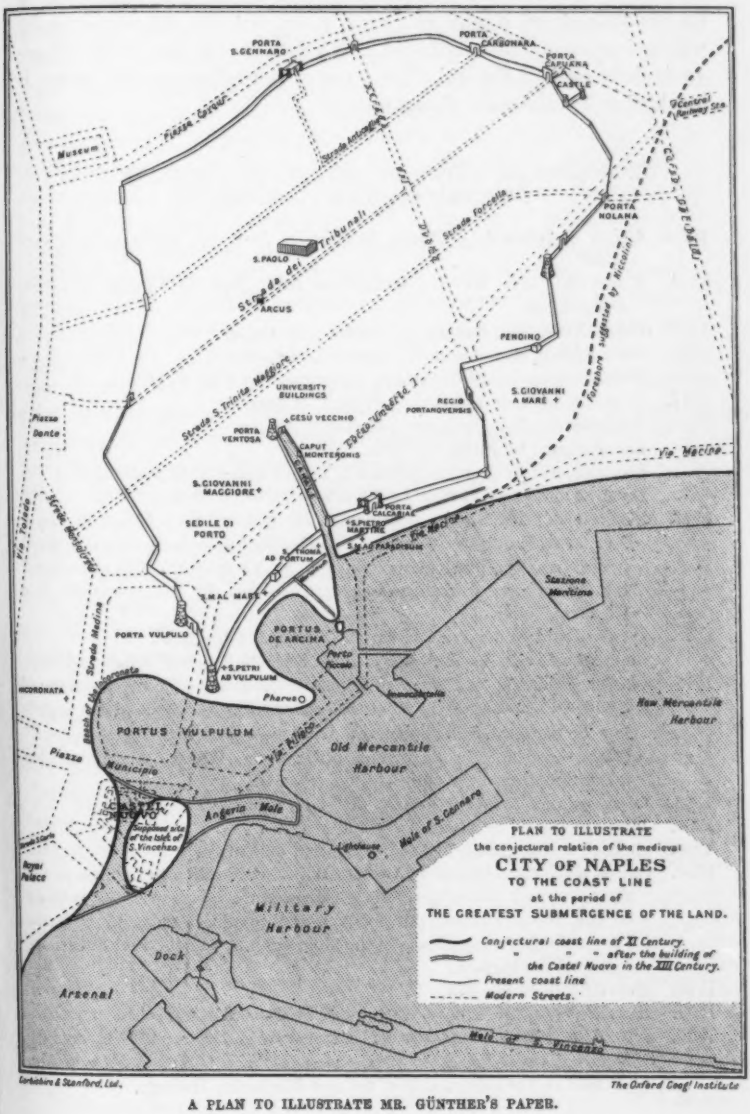
A slight upheaval of the land may have taken place before the epoch of the great Angevin constructions of the thirteenth and fourteenth centuries, and this upward movement would have tended to increase a foreshore which was always being extended by the detritus from the town.

The upward movement was probably irregular in character. The rapid phase which coincided with the close of the sixteenth century has been noted, but, notwithstanding, the altitude of the land in Roman times has not been again reached, with the result that many Roman antiquities are now found below sea-level. At the present day a slight downward tendency is indicated.

The accompanying map has been prepared in part from a plan of Naples, illustrative of a memoir by Capasso, entitled "Topografia della

* Capaccio, 'Forestiero,' p. 1006.

città di Napoli nell' XI. secolo." * The scale is approximately 1 : 16,000, but is much distorted in parts, owing to the imperfection of the



A PLAN TO ILLUSTRATE MR. GÜNTHER'S PAPER.

* Published in 1895 by the Società Napoletana di storia patria.

representation of the course of the ancient town wall. The modern shore-line is from the Italian chart.

Many of the localities mentioned have disappeared in the process of the *sventramento* of Naples in recent years, but the interested reader will find most of them indicated by Carletti in the map to his 'Topografia della città di Napoli.' For a few of the references the author is indebted to Dr. Beloch's 'Campanien.'

CHRONOLOGICAL TABLE OF IMPORTANT CONSTRUCTIONS ERECTED ON THE FORESHORE.

1028. *Chiesa S. Leonardo a Chiaia*, founded by Leonardo d'Oria on a "small islet."

1224. *Chiesa S. Pietro Martire*, erected on land given by Charles I. to the Dominicans.

1283. *Castel Nuovo*, commenced by Charles I. of Anjou.

1285. *Molo Piccolo*, commenced by Charles I. of Anjou.

1302. *Molo Angioino*, or *Molo Grande*, commenced by Charles II.

1447. *Molo Angioino*, extended by Alfonso I. of Aragon.

1500. *Lanterna del Molo*, built by Frederick of Aragon.
Reconstructed by Pietro di Toledo.
Reconstructed by Antonio Alvarez di Toledo, Duke of Alva, 1623.
Restored to its present form by Ferdinand II. of Bourbon.

1577. *Arsenale di Sta. Lucia*, constructed by Viceroy Don Indigo di Lopez Mendozza, Marquis di Mondejar, who abolished the old arsenal which stood between the Dogana del Sale* and Sta. M. Visitapoveri. He commenced the fine Piazza d'Armi, which was finished by his successor, Don Giovanni Zuniga.

1578. *Dogana*, built by the same viceroy in the reign of Philip II.
Restored under Philip IV. by Don Inigo Guevara, Conte d'Onnate in 1653.

1578. *Chiesa Sta. Maria del Pilar*, built opposite the Dogana for the devotions of Spaniards who adored the saint under that title on account of her apparition to S. Giacomo in Saragozza, when she gave him her image on a column, called Pilar degli Spagnuoli: hence Piliero. A fountain has taken the place of the church.

1592. *Causeway and Bridge to Castello dell' Ovo*, made by Zuniga.

1668. *Darsena* (Dock), by Pietro Antonio d'Aragona.

1683. *Arsenale a Sta. Lucia*, fortified by Viceroy del Carpio.

1740. *Strada del Piliero*, formed by Charles III. as a protection to the new part of the town near the harbour. He constructed the bridge over the entrance to the Porto Piccolo; his other works were the Spianata with the Immacolatella, a second arm of the Molo Grande, and the Fort S. Gennaro to defend the harbour.

1755. *Molo dell' Immacolatella.*

1792. *Arsenal* near Castel Nuovo, constructed by General Pomereul.

1830. *Molo di S. Vincenzo* commenced. Extensions in 1868 and 1881, when the *Molo orientale*, the *Molo curvilineo*, and the adjoining dock were also planned on the eastern side of the new Mercantile Harbour.

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* The Dogana del Sale stood behind the theatre of the Fondo.

CANADIAN SURVEY METHODS.*

Major Hills' report on the Survey of Canada will surprise many who have had no better opportunity of judging Canadian methods than those afforded by the results, which are given to the public in the form of maps. As a rule, Canadian maps are so well turned out, so clear in detail, and so artistic, that the process of their evolution is taken for granted, and the impression they produce is altogether favourable to an assumption of accuracy and precision. But Major Hill's report is disconcerting. We find that the patchwork system of compilation from various sources, differing greatly in degree of reliability, is as prevalent in Canada as it has unhappily been in other parts of the world where maps have been trusted and found wanting. There has been no central organized system of map construction on the basis of sound triangulation—no strong backbone of well-determined and well-fixed points on which to base topographical detail. The result has been the usual one of time lost, money wasted, and much work repeated over the same ground. Major Hills condemns the provincial maps as valueless, and tells us that the better organized mapping of some of the mountain regions of Canada on the scale of $1\frac{1}{2}$ inch per mile was finally abandoned on account of its cost. Even the "Geological" Survey maps are said to be rough in execution, and hardly worthy to rank higher than reconnaissance sketches. To those who have read certain recent works on surveying which have emanated from Canada, dealing more especially with the art of topography and phototopography, all this is surprising; for certainly the theory of map-making in all its smaller-scale branches seems to be thoroughly well understood by our friends across the Atlantic. The truth is that Canada has not sufficiently studied the results of those experiences in the older fields of the East which have been dearly bought at the expense of wasted time and wasted money—experiences which point to the necessity for systematic organization *ab initio*. No part of Major Hills' report is better worth study than his emphatic condemnation of the time-honoured notion that a trustworthy map can be compiled from irregular material, such as farm surveys, military sketches, and the like, or that such patchwork efforts can really be valuable even for the loosest military or administrative purposes. Major Hill's report gradually lapses into a treatise on surveys generally (with special application to Canada), and in this capacity it does little more than advocate the same doctrines that have been advocated by Indian surveyors for years past. The cheapest and the quickest, and indeed the only satisfactory, method

* 'Report on the Survey of Canada.' By Major E. H. Hills, C.M.G. With Maps. Intelligence Department, War Office. 1904.

of arriving at a trustworthy map of any country is to begin at the beginning with a strong central axis of first-class triangulation—triangulation, that is to say, of the class which has been applied to geodetic purposes, and which is executed with all the rigorous accuracy that geodetic science requires, but (in these days) without the cumbrous apparatus and consequent cost of old methods. Upon this must be based triangulation of a lighter character and of varying degrees of accuracy according to the nature of the country to be dealt with; but it must be triangulation, always triangulation, at starting. Major Hills' remarks about the correlation of linear with angular measurements are worth careful attention. Excessive accuracy in one function of a survey system is obviously wasted if others are not adjusted to the same level. This is indeed a matter which is constantly overlooked, even in such details as the relationship between the graduation and telescopic power of the ordinary theodolite. Major Hills' programme for the formation of a complete survey department for dealing (presumably) with Canada, offers certain points for criticism in detail, although it is most carefully worked out and full of most valuable suggestions. We cannot, in the first place, agree with him when he maintains that an absolute determination of longitude can be effected with much the same degree of accuracy as that involved in the determination of latitude. The most elaborate observations will sometimes fail (as in the case of the Madras determination), so much so that no geographical surveyor, in these days, ever wastes time over an absolute determination of longitude so long as he can preserve his position differentially by triangulation or by telegraphic time signals. Observations for latitude and azimuth, on the other hand, he repeats at every good opportunity. Nor do we agree with Major Hills' estimate of the strength in personnel required for a survey party. The "clerk and computer" would soon have to be replaced by a recorder and at least two computers. The system of computing in duplicate, which is adopted in India, is an admirable preventive against arithmetical error. The rapidity with which two computers will work against each other is an advantage, in the first instance. Certainty in result is, of course, the main object, and the possession of a duplicate copy at the conclusion of the work is a yet further advantage. A saving both of time and money is effected by duplicate computation. Nor are two triangulations necessary in order to keep six topographers supplied with material to work upon. But these are all minor details. As a framework on which to base an organized system of survey for a wide country, Major Hills' programme is admirable. As regards a military administration for surveys generally, Major Hills is not altogether correct in quoting India as an example of the successful adoption of such a system. The survey of India is directly under the control of the authorities of the Home Department of the Indian Government, and it is essentially a civil

department, although it admits of the employment of military officers, and usually reckons an officer of the Royal Engineers as its administrative chief. The geographical surveys which are carried out during the progress of a campaign are conducted by officers (not necessarily military) of the Survey Department; but those officers can claim no military rank in the field, and do not even command their own escorts. With them is usually associated what may be called the sketching contingent of the Intelligence Department. Lately the senior officer of the Survey Department in the field has been officially attached to the Army Staff, but he is not always recognized by the general commanding as under his orders. The value of systematic and scientific surveys in the military field has not yet been fully recognized; out of the field, survey administration is purely civil. This system is one of the many anomalies which the strong hand of Lord Kitchener (himself a surveyor) may be expected to sweep away. It has led to a great deal of very irregular map-making.

We may, in conclusion, point out that an excellent article on the recent position of geodetic science has been written by Commandant Bourgeois in the April number of the *Revue General des Sciences* (edited by Mr. Louis Olivier, 22, Rue General Fay, Paris).

T. H. H.

MAP SHOWING THE WORK OF THE NATIONAL ANTARCTIC EXPEDITION.*

Note by the PRESIDENT.

We now present the Fellows and the public with a map accurately showing the discoveries of the Antarctic Expedition. Names have not yet been given, except in two or three instances.

It was compiled at Lyttelton, from numerous observations, by Lieut. Mulock, a careful and accomplished draughtsman, who joined the *Discovery* from the *Morning* in February, 1903. Lieut. Mulock had experience in sledge travelling with Lieut. Barne, and went beyond 80° S.

The positions fixed by observations, magnetic variations, soundings, heights, and the tracks of the sledge travellers are clearly shown, as well as the track of the ship to her furthest point along the coast of King Edward VII. Land.

The inset map shows the position of the discoveries with reference to the circumpolar area.

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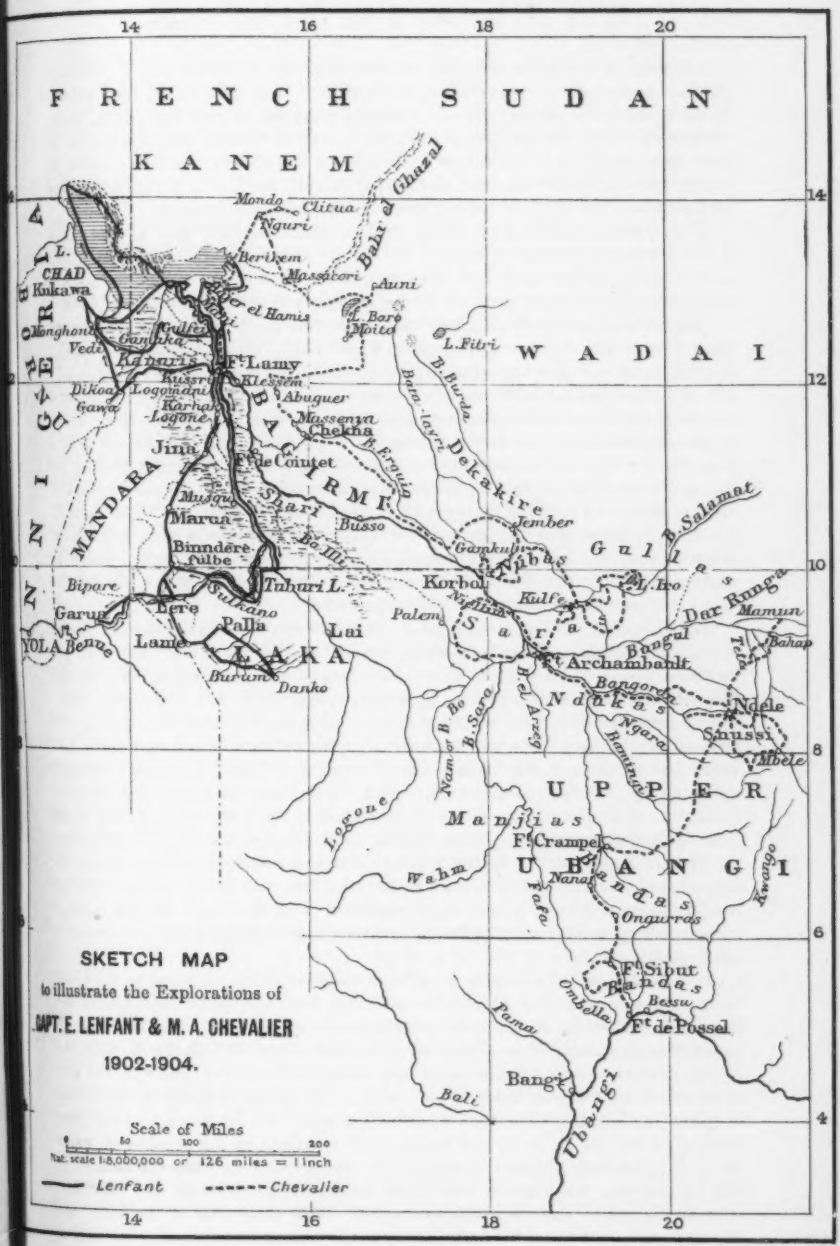
* Map, p. 248.

FRENCH EXPLORATIONS IN THE LAKE CHAD REGION.

Towards the end of May, accounts were given before the Paris Geographical Society of the work of the two expeditions—those of Captain Lenfant and M. Chevalier—which have lately returned to France, after achieving such important results as regards the geography of the region around Lake Chad. Through the courtesy of M. Rabot, secretary of that society, we were favoured with advance proofs of the papers of the two explorers—since printed in *La Géographie*—which enable us to give the following condensed account of the expeditions and their geographical results.

Captain Lenfant, as is known, left Bordeaux in July, 1903, for the purpose of examining the capabilities of the route to Lake Chad by way of the Benue and Kebbi, which it was hoped would prove shorter and easier than those previously used by the Congo and Niger. He was accompanied by MM. Delevoye and Lahure, the latter of whom had been one of M. Duchesne-Fournet's party on his expedition to Abyssinia. For the river navigation he took with him a steel boat specially built for the purpose—the *Benoit-Garnier*—measuring 41 feet long by 8 feet wide and drawing only 2 feet when loaded. Thanks to the energetic help of Mr. Watts, of the Niger Company, the expedition was transferred to the steamer *Liberty*, and a start made up the Niger, within two days of the arrival at the Forcados mouth. On August 26 the German post of Garua on the Benue was reached, and beyond this the expedition relied on the *Benoit-Garnier* only. Before describing its navigation of the Kebbi, Captain Lenfant gave a general sketch of the geography of the region of the lower Shari, which he describes as an immense basin with almost imperceptible slope, extending from Dikwa in the west to Lake Fittri in the east, and from about the 10th parallel in the south to a "dune" or line of slight elevations, breached here and there, which runs south of Lake Chad, and is fertile and well peopled. The floor of this basin is composed of compact clay, and within it are included both habitable lands, such as the district of Musgu, and depressions covered by water, such as the Tuburi lake. The district of Kotoko, which extends from 11° N. to the mouths of the Shari, is a depression which receives the overflow of the Logone, and discharges its waters either into this river by a number of small channels, or into Lake Chad by a series of deep "Bhar," which showed a considerable current even at the height of the dry season. This depressed area is of so regular a surface that many channels have been hollowed out by the waters, and there are various waterways connecting the Shari and Logone. It would seem to be the basin of a lake formerly of much greater extent than the present, of which Lake Chad is the last remaining vestige, destined soon itself to disappear. There is a legend in the country which is of interest in this connection. The Saos—a former race—are said to have been of giant stature, and to have used earthenware pots capable of holding some fifty gallons, of which the men could carry three at once. In one year, when the rains had failed, the wells all dried up, and one of the Saos went to get water from the Logone, but on his return found the rest of his tribe dead from thirst. The Saos were probably the predecessors of the present Kotoko race, and the story may possibly indicate that, as a result of a drought lasting through several consecutive years, Lake Chad, whose waters formerly covered this region, fell considerably, and retreated behind the line of dunes mentioned above, leaving the more southern region dry. Such is, unhappily, the general history of the arid lands abandoned each year by the lake.


FRENCH SUDAN
KANEM
WADAI
BAGIRMI
MANDARA
LAKA
UPPER UBANGI
Mondo
Clitua
Nguri
Beri
Massakori
Auni
Bahr el Ghazal
Bahr el Hamis
L. Bare
Moito
L. Fitri
B. Burdu
Bata-lavri
Dekakire
Jember
Gulfei
Kaburi
Ft Lamy
Klessem
Abuguer
Massenia
Chekna
Fergia
Jina
de Coutet
Musgu
Shari
Maruo
Busso
Bo Mi
Binndere
fulbe
Gamkulu
Nabas
Gula
B. Salamat
Bipore
Tuburi L.
Korbol
Kulfa
Dar Runga
Mamun
Garua
Kulkano
Palem
Sara
Bangal
Tebi
Bahap
Lere
Palla
Lai
Lamle
Benue
Buruno
Danko
Ft Archambault
Bongoro
Ndokas
Ngara
Ndele
Sinussi
Mbele
Nam or Bo
B. Sara
B. Aregi
Manjias
Ft Crampel
Wahm
Nana
Pafa
Ongurras
Logone
Ft Sibut
Bandas
Bessu
Ft de Possel
Ombella
Panna
Bali
Bangi
Ubangi
SKETCH MAP
to illustrate the Explorations of
CAPT. E. LENFANT & M. A. CHEVALIER
1902-1904.
Scale of Miles
0 50 100 200
Nat. scale 1:8,000,000 or 126 miles = 1 inch
Lenfant
Chevallier
14
16
18
20
2
4
6
8
10
12

The surface of the basin is broken at wide intervals by blocks of red granitoid rock and quartz porphyry, which must once have been reefs in the lake-waters. Towards the Kebbi the formation is a detritus composed of mica and gneiss, while between this river and the Tuburi there are barriers of volcanic blocks arranged in lines from north to south. From the lake to the Tuburi the rise of level is imperceptible, but from the latter the ground falls to the Kebbi, which must once have formed a branch of the ancient system of submarine depressions.

The drainage of this part of the African plateau recalls that of the lakes of the Timbuktu region, but whereas in the case of the Niger the descent by the Bussa rapids is spread over some 60 miles, in the case of the Kebbi the drop is compressed into the space occupied by the cataract and associated rapids at Lata.

The principal artery of the Chad basin is the Shari, but the Logone is the more active river. The Shari attains in places a vast width, with a considerable depth; in 1903 its summer rise amounted to 24 feet, while that of the Logone reached 16½ feet, the current of the latter being much more powerful. About the 10th parallel its waters spread over the plains, and some of them reach the Tuburi, there being no line of hills on the west bank, as some had supposed, to bar their access to this lake. Lower down it inundates the Kotoko region, some of the water finding its way to the Chad by the Bahr Afade and the Bahr Ngala, while the rest swells the Shari at the junction of the two streams in the latitude of Manjafa. The Tuburi, which is connected with the Logone by a small river, navigable at high water only, is a wide and deep lake, forming a hook-shaped loop towards the south, which is prolonged towards the Kebbi by an impetuous torrent which winds among the volcanic masses of which mention was made above.

Lake Chad can no longer be regarded as a vast inland sea, affording the means of brisk commercial activity between its shores. Year by year evaporation restricts its limits, and on the borders of Kanem, on the east, the islands seen by Overweg have become *terra firma*, while the sandbanks spoken of by him have been transformed into islands, and the masses of floating herbage are in their turn taking the form of sandbanks. Thus the traveller who stands on the old lake-shore has before him three zones of islets in course of formation, ranged in regular lines and separated by channels, sometimes of great depth, and maintaining a uniform direction. A similar phenomenon is to be noticed in the north, while in the south there are wide, grass-covered banks broken by small expanses of open water, and the town of Ngornu, found by Barth in course of re-establishment after an inundation by the lake, is now at a distance of 20 miles from the shore. In the extreme east the Bahr-el-Ghazal is no longer connected with the lake, the intervening stretch having become a millet-field of great fertility, thanks to the rich alluvium left by the waters.

It is quite intelligible that in a region of such imperceptible slope as the Chad basin, enormous areas may be withdrawn for ever from the fertilizing effects of the inundation as a result of several consecutive years of drought. The lake has an annual rise, due to that of the Shari and to the waters derived from the Kotoko and Musgu countries; and, singular as it may seem, this rise takes place in the dry season, towards December, reaching its maximum of about 23½ inches in the middle of January, when there has been time for the region to the south to have been thoroughly drained of its surplus water. But inasmuch as the amount of water received is less than that lost by evaporation and percolation, while the rainfall is also diminishing, the absolute level sinks progressively, although the difference between high and low water remains constant. With the retreat of the lake into its deeper and more restricted basin, the loss will become proportionally less, and a condition of equilibrium will in course of time be set up. The lake no longer

retains its heart-shaped form shown on our older maps,* but has rather that of a kidney bean. It measures some 125 miles by 40, but in spite of its smaller area the north-east winds still raise a heavy swell at times.

To return to the course of the expedition. The Kebbi—which from its exit from the Tuburi takes a south-westerly direction, afterwards expanding into the lakes of Trene and Lere, and flowing on to Bipare by a multitude of sharp bends—was found to carry a considerable volume of water, the depth never falling below 6 feet, until in the neighbourhood of Lata, where the one obstruction to navigation occurs. There is here a fall of 165 feet, preceded by rapids, though below the fall the river is quite placid. The difficulties are increased by the precipitous walls of rock on either side. It was necessary to take the *Benoit-Garnier* in pieces at Bindere Mundang and transport it to Sulkano, a distance of 20 miles, which was at last accomplished in spite of difficulties with the natives. At Mburao, amid the mud and miasmatic swamps of the Tuburi, it was again put together, and on October 17—the water still rising—a start was made in search of the hoped-for connection with the Logone, on which the practicability of the route so much depended. A grassy plain without a single elevation extended to the north-north-east, across which the party struggled for five days in stifling heat, the boat constantly sticking fast in the mud. But on the 28th a small river was found which traversed a series of pools and led to a wide and deep marsh covered with water-plants, in which the current of the Logone was at last perceptible. The latter stream was entered and descended to Fort Lamy, the journey being continued to Lake Chad after a stay of ten days at that post. The expedition broke up into three parties, one of which made the circuit of the lake in the *Benoit-Garnier*, while the other two examined the country to the east and west, collecting the information on the geography of the region, the salient points of which have been summarized above.

Captain Lenfant expresses a very unfavourable opinion of the part of Bornu with which he became acquainted, which is, he says, but little populated or cultivated, while it is threatened with progressive aridity by reason of the frequent failure of the rains. Game is also scarce here, while in the French territory on the right bank of the Shari it is very abundant. The extreme south of Bornu comprising the clay formation once covered by Lake Chad, is still poorer. It is only in the Fulbe country, from Belda to the Mayo Kebbi, and from Mandara to the Musgu, that prosperity is once more seen.

In comparing the Chad region with that of the middle Niger, of which he has a high opinion, Captain Lenfant comes to a conclusion decidedly unfavourable to the former. The districts at present occupied by France may be divided into two groups, the first called by Captain Lenfant the Kebbi colony, including the Mundang country and neighbouring districts on the Logone and Tuburi; the second stretching from the Shari to Wadai, and from Kanem to Bagirmi. The first is rich, fertile, and well peopled, while the second is practically valueless. It is, therefore, on the first region that the principal efforts at development should be directed. One of the most important districts is that around the Fulbe settlement of Bindere, of the richness of which the explorer speaks in glowing terms. He was delighted with the aspect of the country at the season of harvest, and even when the crops were gathered in, the pastures with their fine herds of cattle and numbers of horses; the shade afforded by the rubber, gum, and *karite* trees; the villages

* It should be remembered, however, that in giving it this form the earlier explorers were indicating the maximum extent at the height of its flood, and fully recognized that even at that date the area was very much more restricted during low water. —[Ed. *G.J.*]

with their granaries and active industries of weaving, dyeing, tanning, etc., gave an equally pleasing impression. This centre, formerly shown as on the German side of the boundary, was proved by an observation of Captain Lenfant's to lie in 9° 57′ 59″, or within French territory, and friendly relations were established with the *lamido*, or king, Bokari by name, who is almost white, exceedingly intelligent, and an honour to the Fulbe race. The cultivation of cotton is particularly active in this district, and great care is taken in the selection of varieties, the dates of sowing and gathering, the methods of weaving and the designs employed; the samples of stuffs obtained here being especially fine. This native cotton is worthy of special attention on the part of Europeans, who may find here a valuable object-lesson in their efforts towards the development of this field.

The water-route investigated by Captain Lenfant and his companions will form, during several months in the year, an excellent means of replenishing supplies and exporting the productions of the country. When the transport system is properly organized, about eighty days will suffice to reach Fort Lamy from Bordeaux in place of the five months required by the Congo and Ubangi.

The second expedition, that of M. A. Chevalier, has been still more productive of geographical results, as it was considerably longer in the field, and covered a larger area of previously unvisited ground. It has likewise contributed not a little, thanks to the scientific attainments of the leader and his assistants, to a better knowledge of the natural productions of the regions traversed. M. Chevalier, who had already made his *début* as an African traveller under the auspices of General Trentinian, succeeded in interesting in his project for a more extended journey such influential personages as M. Gentil, M. Binger, Dr. Hamy, and others, and likewise obtained the countenance and support of various public departments. After two years' preparation, the arrangements were finally completed in April, 1902, and by July 17 of that year the party was united at Brazzaville, whence the voyage to Bangi was accomplished by steamer.

M. Chevalier describes the transition from the grass-lands subject to annual burning, where two shrubby species of *Landolphia* form the chief economic resource, to the equatorial forest, with its more varied products of cola, coffee, vanilla, copal, in addition to rubber-vines and the one important rubber-yielding tree, the *Funtumia elastica*, which is indigenous to the African continent. In spite of its latent wealth, this forest region has not yet yielded results commensurate with its promise, and the Bonjo race which inhabits it—which, though much given to cannibalism, was, like the Niam-Niams, possessed of a considerable degree of indigenous civilization—is at present, owing to the force of circumstances, one of the most wretched of African peoples. The transport system on the upper Ubangi is still in a rudimentary state, and its navigation was a matter of much difficulty. At Krebeje or Fort Sibut, on the Tomi, an experimental garden was formed, and plants and seeds of fruit trees, and other useful plants which had been taken out from France, were at once placed in the ground, to the number of 460 species. After preliminary studies in the Banda countries, the leader set out on November 11, accompanied by M. Courtet, for the states of Sultan Snussi. The passage from the basin of the Ubangi to that of the Shari takes place across a district now completely uninhabited, though a few years ago it possessed populous villages; among the causes mentioned for this state of things being (in addition to famine, the attacks of the Bandas, and the like) the flight of the people to avoid the enforcement of porterage. The cannibal Manjias—whose habitat begins at the water-parting—are, like the Bonjos, in a state of great misery, though formerly possessed of a fair amount of civilization. They are

grouped into a number of patriarchal clans, and seem to have originally come from the west, while the Bandas had their home further east. Both races dwell side by side at Fort Crampel, the nearest French post to Ndelle, the capital of Sultan Snussi.

To reach the latter, twelve marches have to be made through a country almost uninhabited on account of slave-raids. The sultan received the travellers with great cordiality, and gave them every facility for their researches, himself supplying much information on the geography of the surrounding region, which, during his many journeys through Dar Fertit ("Country of Savages"), he has learnt to know thoroughly. It was by guides supplied by him that the travellers were taken to the elevated region at the junction of the Congo, Shari, and Nile basins, where a new species of wild coffee, named by M. Chevalier *Coffea excelsa*, was seen growing. The tree reaches a height of 50 or 60 feet, and its produce—which has an exquisite aroma—has long been known to the Arabs, a small quantity finding its way each year to Wadai. Twenty years ago it was seen by M. Rivière in the markets of Tripoli.

After some hesitation, Snussi gave permission for the travellers to visit the Mamun marshes, which they had heard spoken of as an inland sea comparable to Lake Chad, but which they found to their disappointment to be nothing but a marshy plain, some 100 miles long, in which the five rivers Tete, Mosuburta, Bungul, Minjia, and Kumara converge. Of these only the Minjia had been previously reached by a European (Potagos), and that near its source. The name Mamun is given in particular to a lagoon $2\frac{1}{2}$ miles long and 80 yards wide, inhabited by hippopotami and situated in the centre of a tract which must be in great measure covered by water at the close of the rainy season. This region, inhabited by the Gulla Home, is the counterpart of the more westerly marshy districts lying between the middle Shari and the Mayo Kebbi. Its great bare plains, with their unproductive clay soil, abound with game of all kinds. The rivers contain several huge kinds of fish, including the *Lates Niloticus*, and the stagnant waters are the home of two strange fish—the *Protopterus*, called *Abkur* by the Arabs, which, when the marshes dry up, encloses itself in a cocoon and remains for several months without a drop of water; and the *Malopterurus*, which gives a violent electric shock to those who touch it. The marshes are likewise infested by the *Bojene*, a fly of the genus *Glossina*, which, like its congener the tsetse, proves very fatal to horses and cattle. The return to Ndelle was made through a corner of Dar Runga, and a visit was also paid to the curious sandstone *massif* of Kuti, seamed with deep gorges whose streams flow in cascades under the shade of oil-palms.

At Ndelle the first rains occurred at the end of March, and the ground was soon covered with a green carpet of turf interspersed with gay flowers. A first essay in the cultivation of rice on a large scale was made by the sultan's women, and a month later a successful harvest resulted from an experiment with Arab wheat, while the plantations of other crops covered a yearly increasing area. The sultan has also made efforts to acclimatize cattle and horses, which he has brought each year from Wadai, and under his auspices commerce is steadily increasing; a part of the products being exported through the French factory, a part through Wadai and Darfur. Much is to be hoped from the enlightened efforts of this remarkable man in the path of peaceful progress.

M. Chevalier left Ndelle on May 2, and reached Fort Archambault on the Shari twenty days later by way of the Bangoran valley. Dr. Decorse, who had previously remained behind on account of ill health, had been there more than two months, and had brought together most valuable ethnographic and zoological

collections. The district around Fort Archambault is the habitat of the Sara race, who quite bear out the statements of Maistre in regard to their exceptionally fine physique, some being quite herculean in stature. They show a surprising vitality in the midst of populations apparently in course of extinction, and, being mild and peaceable in disposition, and industrious agriculturists, are one of the most promising of all African races. They possess a hardy breed of small horses. Their country, with its thriving fields shaded by fine trees, recalls the fertile belt of the Western Sudan, of which all the characteristic trees except the baobab are represented. The people, too, show many resemblances with the Mande race. East of the Shari the type of the country and people changes in proportion as we proceed towards Wadai. The first river met with is the Bahr Keita or Auk, which represents the Bungul combined with all the streams of the Mamun plain and Jangara. It is but a small stream, nearly dry in the dry season, for in this zone of low-lying plains much of the water is absorbed by the swamps and old sand-obstructed channels, so that the streams are much more powerful in their upper than in their lower course. The Bahr-Salamat, a little further north (the only river of Wadai which brings any water to the Shari), is dry during a large part of the year, being, in fact, merely a *wadi* 200 yards wide in the neighbourhood of Lake Iro, with banks 16 feet high cut in the clay, between which water flows for four or five months only. From Dar Runga to its junction with the Shari, it flows through a bare plain of impermeable clay, full of crevasses and depressions in which the water collects during the rains. The largest basin is Lake Iro, which only measures 11 miles by 5½, including a wide grassy margin flooded yearly. The natives of the country round the lake belong to the Kulfe or Gulla stock, forming a dozen or so of tribes, each independent of the others. Their villages are built on small rising grounds above the limit of the inundations, and are generally fortified, like those of the Ndukas of the Bangoran, by one or several fences of spiny shrubs, in the midst of which are the circular clay huts, with such narrow entrances that the occupiers have to crawl in like a cat. This seems to be for the sake of protection against wild animals, which come in great numbers during the dry season to drink at the lake. The inundations last six months, and the people then move about at ease through the mud and water. Their legs are abnormally long for the size of their bodies, and, were it not that they appear to be nearly related to Kabas and Eastern Saras, might be taken for a special race of amphibious beings. The last-mentioned tribe, which dwells south of the Bahr-Salamat and has no connection with the Western Saras, consists of three great families, the Jinges, the Ngakes, and the Mbangas. They are of robust physique, but have been much impoverished by the raids of their neighbours. The women disfigure themselves frightfully by the objects which they insert in their ears, noses, and lips, the wooden discs introduced into the lower lip being sometimes as large as a small plate.

North of the Salamat dwell the Buas, Sokoros, and the Nubas or Fagnias, the last dwelling in minute beehive huts perched on almost inaccessible rocks, while they flee in case of attack into caves hidden in the cliffs. From the granite ridges of the Niellims, a dreary plain of impervious clay, with thorn scrub and dum-palms, and occasional grassy depressions inundated during the rains, stretches away into the heart of Wadai. Ancient watercourses, now in great part choked in the sand and known as "minias," are often met with, while "batas" are watercourses in which there is an annual flow of water during one or several weeks. Such is the Bata Lairi, which formerly carried the overflow of the Salamat and Bahr-el-Abiad to the Bahr-el-Ghazal and lower Shari, and which still conveys some of the flood-water of the middle Shari to the neighbourhood of Lake Fittri; though it does not

now reach the site of Lake Baro, which has been dry for several centuries. The whole country, which forms part of the belt of impermeable clay stretching from the middle Niger to the Nile, must once have been traversed, like the Netherlands, by an interlacing network of channels, and the greater part of Bagirmi is composed of similar country. East and south-east of the Lairi, the granite eminences of the Nubas emerge from the scrub-covered plain in the form of sugar-loaf peaks or elongated escarpments, the immediate vicinity of which consists of sandy ground capable of cultivation. The Gueres mountains, which M. Chevalier was unable to visit, are a vast pile of rocks forming a high plateau watered by a perennial river, though Barth was mistaken in believing that frost and snow are known here. The plateau is inhabited by the Kengas, a pagan tribe.

In Southern Bagirmi Mohammedan colonies are met with from the tenth parallel northward. In this part of the country the flow of water in the rivers is very uncertain, and cannot be counted on for regular navigation. In the loop of the Shari known as the Bahr Ergig or Ba-Mbassa ("little river"), which was well filled for several weeks in 1897, no continuous flow seems to have been established either in 1902 or 1903, though in the latter year the level of the flood in the main Shari was considerably above the average of the preceding years. The capital of Bagirmi, since the destruction of Massenya, has been at Chekna, on the banks of the Ba-Mbassa, but when the bed of this is dry, viz. from March to October, the town is almost without drinkable water, and it presents a miserable appearance, its trade being quite insignificant. Most of the goods sold are of English origin, coming chiefly from Yola, on the Benue. A small amount comes from Khartum through Wadai, but the trade across the Sahara through Kanem has entirely ceased during the last few years. Massenya is now nothing but a heap of ruins already beginning to be choked by vegetation. The Sultan Gaurang, who received the expedition most cordially, is, like Snussi, one of the great personages of present-day Africa, but much time will be needed before Bagirmi can, under the philanthropic tutelage of France, recover its former prosperity. There now remain only some 100,000 inhabitants out of the million at which Barth estimated the population, but the country still retains elements of well-being which give hope for the future, though the whole northern part of the kingdom, belonging to the clay zone already described, is exceedingly poor.

Like Captain Lenfant, M. Chevalier saw many signs of a much greater extension of the water system of this part of Africa. He is inclined to believe that once a great river, of which Lake Chad was only a backwater, flowed north across the Sahara to the Mediterranean, and that the abundant relics of the Neolithic age found throughout Northern Wadai and the districts adjoining the Bahr-el-Ghazal are indications that a prosperous community once lived on its banks. The vegetable and animal remains met with in the countries traversed afforded countless proofs of a progressive desiccation, and the invasion of the Sudan by a Saharan climate. But the process does not progress regularly, for as a result of several consecutive years of abundant rainfall, Lake Chad has at various times spread beyond its usual bed, flooding large areas and taking several years to retreat within it again. There is a native tradition of a deluge which once destroyed all the peoples of Central Africa, and this has been modified by the Arabs, who hold that Noah came this way during the flood, and that his ark afterwards struck ground on the rocks of Ajer-el-Amis. In 1870 the lake rose to an exceptional height, and again in 1897 a rise took place, but since this date the waters have continued to fall. The greater part of the water-channels which remain will probably dry up in the course of a few centuries. A similar fate has already overtaken other lakes; *e.g.*, as a result of the drought in 1902, Lake Fittri had completely dried up in

1903, and the hippopotami and certain of the fish which inhabited it have left it never to return. Kanem is likewise a dried-up country, and no illusion should be cherished regarding its value.

Summing up, M. Chevalier holds that, in spite of the present ruin brought about by slave raids, the Central Sudan possesses resources which will give it a value when the policy of peaceful development has borne fruit. Like the whole belt of country from the Atlantic to the Nile, it may be divided into three zones, each with its own proper products, the intermediate one being the best peopled and the home of the most flourishing agriculture. Like Captain Lenfant, M. Chevalier foresees a great future for the systematic cultivation of cotton in this region.

REVIEWS.

EUROPE.

Commercial Geography of Germany.

'Handbuch der Wirtschaftskunde Deutschlands. Herausgegeben im Auftrage des deutschen Verbandes für das kaufmännische Unterrichtswesen.' Dritter Band. Die Hauptindustrien Deutschlands.' Leipzig: 1904.

The issue of the third volume of this compilation marks an important step towards the completion of the original design of those responsible for the inception of the work. It is now possible to take a general view of the whole, and to estimate the relative importance of the various elements. The intention is to give a description of the economic life of Germany, which shall have a certain completeness and independence, and be sufficient to meet the requirements of the more advanced student of industry and commerce in the preparation for the active life of business. The only general scientific basis for a work of this type is geography in the broadest sense; accordingly, the first volume is entirely devoted to the general geographical description of Germany. In its method it is a protest against the old-fashioned plan of enumerating facts without any attempt at explanation. The well-equipped man of business must be acquainted, not merely with the phenomenon, but also with the cause. The volume deals first with the broad physical divisions of the country, and the geological formation, with especial attention to such questions as the distribution of useful minerals. Climatic conditions are treated more particularly in the light of their influence on industry and economic life. The section is completed by an account of the useful animals, tame and wild, the fisheries, and the character and distribution of the population. The method of treatment is determined by the object of the work. Attention is necessarily devoted to the economic rather than the physiographical aspect, the consequences rather than the causes of the phenomena described. This is especially noteworthy in the section on climate, in which considerable space is given to the discussion of the influence of temperature, rainfall, and sunshine on the growth of organic life, the mortality of the population, and the organization of industry. The chapters on useful plants necessarily partake rather of the character of enumeration, though in the matter of thoroughness the enumeration leaves little to be desired.

The second volume deals in detail with the agricultural, pastoral, and forest industries of Germany. The various sections are prefaced by brief historical monographs, and treat systematically of the distribution and interconnection of the various industries, the disposal of the products, cost of transport, and character of the markets. The geographical element is not neglected, but its scope is smaller

than in the earlier part of the work. The third volume tends to be even more technical. It deals elaborately with industrial organization under the divisions of the different trades and occupations. It contains a mass of statistical and other information which we are accustomed to find in official reports and trade papers of a technical character. There are sections on the distribution and sources of raw material of various industries, but on the whole the geographical aspects of the subject tend to disappear in the technical. This can scarcely be avoided, in view of the very miscellaneous character of the subject-matter included in the volume. Its main value is as a book of reference on special points, a value greatly enhanced by the bibliographies attached to each section. To the student of geography, the earlier volumes, with their numerous special maps, and interesting deductions, based on the laws of natural phenomena, will provide the greater attraction. The series will be completed, in so far as Germany is concerned, by the promised fourth volume, dealing generally with the conditions of transport and foreign trade.

A. J. S.

ASIA.

An Expedition to K_2.

'Six Mois dans l'Himalaya.' By Dr. J. Jacot Guillarmod. W. Sandoz: Neuchâtel. 1904. Pp. 363. *With Three Maps.*

In 1902, a party, consisting of Messrs. Eckenstein, Knowles, Crowley, Pfannl, Wessely, and the author of this book, spent eight months on a journey to peak K_2. A series of misfortunes prevented them from an attempt to reach the summit of the mountain, but a height of 22,000 feet was attained. The route followed from Rawal Pindi struck north-east into the valley of the Jhelam and to Srinagar, thence by the Sind and Dras valleys into that of the upper Indus, to Skardu, thence to Askole, and so up the Baltoro glacier. On the return journey a more direct route was followed between Skardu and Srinagar. The party arrived at a high altitude successfully, and established camps on Godwin-Austin glacier at successive altitudes from 16,592 feet to 21,000 feet. On July 10 Messrs. Guillarmod and Wessely attained an altitude, on one of the spurs of K_2, of 22,000 feet, and had every expectation that a further attempt would carry them higher still. After this, however, bad weather set in, one of the party fell seriously ill, and none retained perfect health; while the decision to return, greatly to Dr. Guillarmod's disappointment, was arrived at when news came of an outbreak of cholera in a part of the country through which the homeward journey lay.

The book, which gains greatly, as all descriptive work does, from the use of the French language, is interesting reading, describing the whole journey from Europe in detail, and the object of the journey apart, providing a foreign traveller's impressions of a part of the British Empire, such as are always acceptable and, in a general way, instructive. The primary object of the expedition was not scientific, and the few scientific notes are almost entirely confined to a short appendix. Some, however, are noteworthy. Prof. Suess had desired Herr Pfannl to watch for the occurrence of sedimentary deposits of periods anterior to the great folding which raised the Himalaya as it now appears, and a little below the junction of Godwin-Austen glacier with the Baltoro, at an elevation of about 15,000 feet, the existence of such deposits was confirmed. The Balti porters accompanying the expedition were found to be unanimous in furnishing certain names of the northern tributary glaciers of the Baltoro which did not agree with those of Sir W. M. Conway's map. A certain amount of botanical work was carried out, and the highest limit of vegetation was found at about 17,400 feet (5300 metres). A table is furnished of daily maxima and minima of temperature from May 29 to August

12 (*i.e.* from Askole upwards and back), the highest and lowest recorded at Camp XI. (20,000 feet) being respectively 35° and —19° Cent. Excellent maps illustrate the journey, one showing the Baltoro and tributary glaciers on a scale of 1 : 200,000. Finally, Dr. Guillarmod is to be congratulated upon a really magnificent series of photographs. There are no fewer than 269 in the text; some of them are too small, and the reproduction is not always perfect, but any deficiencies in these find compensation in the ten beautiful photogravures, which are beyond praise.

O. J. R. H.

China.

'The Back Blocks of China.' By R. Logan Jack. London: Edward Arnold. 1904.

In 'The Back Blocks of China' Dr. R. Logan Jack describes a journey undertaken by the author and his son at the instance of the Chinese Government to examine the mining capabilities of Western China, an account of which was read to the Society on January 13, 1902. After travelling from Shanghai to Cheng-tu, expeditions were made to the north of the province, and to mines in the nearer neighbourhood of the capital. Then, journeying to the south-west of the province, a stay of some weeks was made at Maha, a gold district to the north-west of Ning Yuan Fu, but the outbreak of the Boxer troubles in China made it necessary for the party to leave the country, and after a vain attempt to reach Assam through North-West Yunnan, they struck south into Burmah. On leaving Maha, it took them over thirty days to travel 370 miles, so great were the physical obstacles in the shape of rivers and mountains which had to be overcome. But the journey led to the discovery of an enormous bend in the Yalung river, a great tributary of the Yangtse, similar in contour to that, but a short time previously discovered in the Yangtse itself by M. Bonin. Additions were also made to our knowledge of the country south of the Yalung's bend, as well as of Western Yunnan. But as Captain Ryder, with Major Davies and Colonel Manifold, was at the time traversing the province in all directions, it is difficult to say who was the first to break untrodden ground.

Dr. Jack gives no information as to the result of his inquiries, nor as to his views regarding the future of mining enterprise in Western China. At Maha, where he spent nearly a month, the quartz mine had been worked for twenty years, and machinery had been set up, each piece of which had been carried there on men's backs. Notes on the geology of the country as far west as Maha are sprinkled through the earlier chapters, but there is less information regarding that of North Yunnan.

The numerous styles of bridge-building attract much attention from the author, and are described with much enthusiasm, as are also the great irrigation works round Chengtu, the capital of Szechuen.

W. R. C.

A Fragment of Kamchatka.

'A Shooting Trip to Kamchatka.' By E. Demidoff, Prince San Donato. London: Rowland Ward. 1904. Pp. xvi., 302. *With Two Maps.*

Though in no way a scientific study of Kamchatka, this is much more than a mere record of sport. Even if it were not, the book would be of value in a geographical library simply for the photogravures and photographs, which number over a hundred—several showing country never before visited unless by natives—and are admirably reproduced. But, as a matter of fact, sport takes a secondary position in the work; for, speaking by the book, it was not remarkably successful, and the time devoted to it, owing to the length of the journey, was of the briefest.

The work, therefore, becomes a highly interesting record of an interesting journey, detailed from the moment of entering upon the Trans-Siberian railway. In this event the first chapter is very happily inserted, for it outlines the history of Kamchatka from the end of the seventeenth century, when a merchant named Alexeieff, who went to an unknown fate, gains the uncertain honour of being the first Russian to enter the peninsula. The part of the country where the author broke new ground lies at the source of the Kamchatka river, which is some 230 miles in a direct line north-east by north of Cape Lopatka, the southernmost extremity of the peninsula in 54° N., 159° W. Its tiny headstream falls immediately into a lake about 2 miles long by three-quarters of a mile wide. (On the large-scale map accompanying the volume it appears as about 9 miles by 4.) Snow-clad hills rise abruptly from it, and its altitude is 3500 feet. It was named Lake Sofka Demidoff, after the author's wife, who accompanied him, together with Mr. St. G. Littledale. Travelling was found very difficult in parts, whether owing to swamp or to belts of rhododendron bush. Mosquitoes were a scourge. As regards climate, snow lay deep in the interior in June; fog is the constant accompaniment of the southerly winds, storms of the north-easterly. The first are prevalent in June and July, which are usually the dampest months in Kamchatka. By July 15 autumn was rapidly approaching. The wild sheep, *Ovis nivicola*, was the object of the sportsman; but bears were also plentiful. Salmon were running up the rivers in countless thousands. It is of interest to note that civilized lures failed against them, though large sea-trout were taken on the spoon. Both are netted and trapped by the natives, and form a valuable article of commerce. On the whole, Prince Demidoff has made excellent use of his visit to what is only a tiny section of this vast peninsula, and the book is a fitting successor to his similar works on the Caucasus and the Altai.

O. J. R. H.

AFRICA.

The Jesuits in Abyssinia.

Camillo Beccari, S.J. 'Notizia e Saggi di opere e documenti inediti riguardanti la Storia di Etiopia durante i secoli XVI., XVII. e XVIII.' Rome: Casa Editrice Italiana. 1903.

This is intended to serve as an introductory volume to a series of reprints of important documents relating to the history of Abyssinia and the work of the Jesuit missionaries in that country during the sixteenth, seventeenth, and eighteenth centuries. Circumstances, not altogether easy to explain, have brought it about that few of the early records, coming from the pens of European writers, have ever appeared in print. Thus of the two earliest and most authentic records—the works of Paez and D'Almeida—although D'Almeida's work has long been known from the manuscript in the British Museum, the very existence in modern times of any such version of the work of the former has been doubted by many writers. But Father Beccari's researches in the archives of Italy and elsewhere have yielded valuable results, in the discovery not only of Paez's original manuscript, but of many other documents bearing on the history of the Jesuit work in Abyssinia, the publication of which will throw light on many points hitherto obscure.

The present volume consists of three parts; the first giving a full list of the documents in question, which include a large number of letters written by the missionaries or their superiors in Europe; the second sketching their contents; and the third reproducing passages from the more important, with an Italian

translation by the side. It is with the portions bearing on the geographical discoveries of the Jesuits that we are here principally concerned, and it is this side of their work which is likewise dealt with in the more important extracts printed. The full text of the documents is to appear in subsequent issues.

The discovery of Paez's manuscript is of special interest from the fact that it contains the first detailed account of the sources of the Blue Nile, the visit to which of that missionary was so unjustifiably descredited by Bruce. Father Beccari is, not unnaturally, very severe on the latter, maintaining that, in the light of our present knowledge, the famous traveller can only be held guilty of wilful falsehood. It is certainly difficult to reconcile his statements with the supposition of good faith, and there can be no doubt that in any case they were made with extreme carelessness, and with a view to belittle as much as possible the exploits of his predecessors. To begin with, his statement that he had inspected three copies of Paez's history is puzzling, inasmuch as the copy lately brought to light is the only one of which any other writer has been aware. But even if other copies existed in Bruce's time, it is still more strange that the traveller should have declared that Paez said not a word about the Nile sources, when the passages printed by Beccari contain not only a full description of the sources, but the expression of Paez' feelings of elation at beholding them himself. In Bruce's treatment of Kircher's version, Father Beccari sees equal evidence of bad faith, holding that it was only by suppressing important passages that he was able to make out a case against its veracity. But the charge can hardly be regarded as proven.

Father Beccari's discovery has also shown the inaccuracy of several of the conclusions drawn by such commentators as Cooley and Beke. The former appears to have assumed, no doubt owing to the Spanish nationality of the writer, that Paez's manuscript was originally written in Spanish, and this certainly seemed supported by D'Almeida's statements, quoted by Cooley, that he had translated portions of the work. But Father Beccari's find is in Portuguese, so that unless—which would seem to be negatived by its being, according to the editor, in Paez's handwriting—the manuscript is a translation from the original, D'Almeida would seem to mean only that he had incorporated parts of the earlier work. Again, Cooley's doubt that Kircher's version was genuine seems not justified, although, as the editor shows, the translation given by the latter is by no means accurate. A comparison of D'Almeida's description of the Nile sources (also printed in the present volume, together with a reproduction of his original sketch-map) with that of Paez, shows that the former did not draw wholly from the latter, but had probably visited the spot himself.

Of the other documents of which extracts are given, the most important are three treatises (one on the Kingdom of Tigre) without author's name, but which the editor shows to have been certainly by P. Emmanuele Barradas; and Alfonso Mendez's 'Expeditionis æthiopicæ Libri tres.' None of these have ever been printed. The editor discusses the reason for this apparent indifference on the part of those at home, and comes to the conclusion that the plain and unembellished language in which the works were written little suited the taste of the time, while, in the case of Mendez's history, the outspoken character of some of the remarks may have been an additional reason for keeping it unpublished.

E. H.

AMERICA.

CANADA.

'Canada in the Twentieth Century.' By A. G. Bradley. Westminster: A. Constable & Co. 1903.

'Through Canada in Harvest Time.' By James Lumsden. London: T. Fisher Unwin. 1903.

These two books are very different in their nature, but both have their value. The work of Mr. Bradley is that of a man who has made himself familiar with many parts of the Dominion by periods of residence and prolonged visits at intervals extending over the last thirty years, and has made excellent use of the opportunities he has had for observing Canadian life and industry, the conditions on which it depends, and the changes that have taken place in the period mentioned. Statistics are almost entirely omitted, but without their aid the author manages to draw a very vivid and interesting picture of both working and holiday life in town and country in those parts of the Dominion with which he is intimately acquainted—that is, all except the three eastern provinces of Nova Scotia, New Brunswick, and Prince Edward Island. Advice of the most practical kind is given for the benefit both of those who may think of visiting the Dominion either as sportsmen or tourists, and of intending settlers. In the description of the country the author shows due appreciation of the geographical features, and his intimate acquaintance with the history of Canada, shown in his previous works, enables him to introduce concise but adequate accounts of the stages in that history which are of most importance in throwing light on the present situation. In speaking of the geography of Canada, Mr. Bradley justly complains (pp. 143, 144) of the nearly uniform practice of drawing maps of the country in such a manner as "to obscure the most substantial and populous and wealthy part of Canada in the eyes of outsiders," devoting to the older Canada a solitary page "mainly filled by the wilderness portion, thereby crowding the home of four million busy fellow-citizens into a meagre strip in a corner perfectly useless for geographical identification." It is, however, to be regretted that Mr. Bradley has himself followed this bad example. The book, which has many excellent pictorial illustrations, is provided with only one map, a general map of the Dominion on such a scale that, for example, it gives no hint of the physical features which mark off on the north and west the limits of the Eastern Townships as interestingly described by the author on pp. 90–92. To this general account of Mr. Bradley's book it may be useful to add a few references to parts of it of special interest and importance. No father who is thinking of settling his son in Canada should omit to read chapter viii., which deals with emigration to the North-West, and very largely with "the young gentleman farmer." Among other passages, one may note the account of the characteristics of the French-Canadian on pp. 51, 52, 117; of the typical French holding and village in Quebec on pp. 67, 68, 82, 83; of the influence of the Roman Catholic Church in Quebec on pp. 31–33, 80, 81, 109, 110; of the distaste of the upper classes in Canada for the land, p. 145; of the original reclaiming of Ontario, pp. 123, 167, 168; of the differences between the climate of southern and northern Ontario, pp. 173, 220; of the range of the chinook winds, pp. 316, 326; his prognostications as to the future of the North-West, pp. 339, 340; his account of the salmon of the British Columbian rivers, pp. 335, 336; of irrigated fruit-farms in British Columbia, pp. 363–365; and of the Chinese in the same province, pp. 392–394. The index, it may be mentioned, is not in every case adequate as a means of reference.

Statistics are as characteristic of Mr. Lumsden's book as their absence is of that of Mr. Bradley. The author was one of a small journalistic party who travelled

through Canada during the harvest of 1902, and who, to quote the preface, "by public bodies and private individuals were given such opportunities of spying the land, as, according to general testimony, had never before been accorded to any body of inquirers from the Old Country." The book is the outcome of this visit, and portions of it appeared in a series of articles in the *Leeds and Yorkshire Mercury* and the *Leeds Mercury Weekly Supplement*, and the text, to use once more the author's own words, "may be roughly described as a combination . . . of the writer's own impressions and matters of fact of a statistical nature supplied by the official departments of the various provinces." The book reflects the buoyant feeling that pervaded Canada during the second bounteous harvest after the bad harvest of 1900, a feeling which, the present reviewer can testify, remained as general and as strong during the harvest of 1903. Hardly any but the rosiest aspect is given to the development of the Canadian North-West. "With never-failing regularity showers fall in June, we are told" (p. 128). It is quite true that no rainfall station of the wheat-growing area of the Canadian North-West shows an entire lack of rain in June; but there are great variations from year to year in the amount, occasionally, it would appear, with disastrous results to the wheat-crop. Both Mr. Lumsden (p. 128) and Mr. Bradley (p. 280) refer to the long summer day as favouring in a peculiar manner the wheat-crops of the North-West. But it hardly needs to be pointed out that the days there are no longer than in England, not so long as in Scotland. The reference to this consideration in English books is in effect the inappropriate transference to England of a point of view proper to Ontario or the wheat area of the United States. Among the statistics of Mr. Lumsden's volume, none are perhaps more interesting than the estimates of the cost of growing wheat on Canadian prairie-land and conveying it to Liverpool given on pp. 119 and 164, 165. It is to be wished, however, that these estimates, which are given, so far as they relate to cropping, on the authority of Mr. Charles Young, president of the Winnipeg Grain Exchange, were a little more satisfactory—at least, in their statement. The whole cost to the farmer of a crop of wheat delivered at the nearest elevator is estimated at about $6 per acre, but from the details given it does not appear how much is taken into account in forming the estimate. Nothing seems to be put down for the value of the land with its improvements. The cost of the labour required for summer-fallowing, the importance of which in prairie-farming is duly emphasized by Mr. Lumsden, is indeed reckoned in, but it does not appear that anything is allowed for the fact that a consequence of this practice is that work is done on two acres, a crop reaped only from one. It is not clear that anything is allowed for the up-keep of horses and the interest on and wear and tear of agricultural implements. Finally, one has a difficulty in attaching any definite meaning to the average cost of haulage to the nearest elevator. This is probably the most variable factor of all. The elevators are all beside the railways, but wheat is sometimes grown upwards of 50 miles from a railway. It would have been more instructive to give an estimate of the cost of production where the conditions are most unfavourable under this head. G. G. C.

MATHEMATICAL GEOGRAPHY.

Navigation.

The Organized Science Series. 'Modern Navigation.' By William Hall. London: W. B. Clive. 1904. Price 6*s.* 6*d.*

Another book on navigation is perhaps something of a work of supererogation; all that can be taught on the science has been admirably said in such excellent old

works as the manuals of Raper, Inman, Norie, and others. Still, a familiar subject may be more attractive, or more interesting, when presented in an unfamiliar form. Mr. W. Hall, in his 'Modern Navigation,' has produced a very complete little book, so handily arranged as to suit admirably the requirements of navigators, and it should prove a useful handbook to more advanced and detailed study. The author's theory that for navigational purposes five places of figures are sufficient, is obviously correct; it would seem that four would be sufficient in the working of some problems. The graphic methods of solution add much to the interest of the book.

The book is a contribution to the Organized Science Series, published by the University International Press, Ltd., and edited by Dr. William Briggs.

D. W.-B.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Distribution of Plant Associations.

'Plant-geography upon a physiological basis.' By Dr. A. F. W. Schimper. Translated from the German by W. R. Fischer. Revised and edited by P. Groom and T. B. Balfour. Oxford: The Clarendon Press. 1904. Pp. xxx. 839. 1 *Photogravure Portrait*, 5 *Collotypes*, 4 *Maps*, *and* 497 *other Illustrations*.

In the year 1898 there was published in Germany a book by A. F. W. Schimper, dealing with the distribution of plants mainly from a physiological point of view.

Hitherto generally, though not entirely, the distribution of the *plant species* had been the subject of study on the part of the phytogeographer. Schimper devotes only a small portion of his great work to the distribution of plant species. It is, on the contrary, concerned chiefly with the distribution of *plant formations*.

Most green land-plants are of sedentary habits, during the stages of vegetative growth, and they are therefore unable to move in search of the raw food-material and the energy which they require for the building up of organic food from inorganic raw material. This energy the green plant derives directly from the sun's rays. The raw material is, with the exception of the carbon derived from the air, supplied to the living cells of the plant by a current of water which is continually entering the plant by its root, charged with salts dissolved from the soil. After passing through the plant, this current of water is as continually leaving the leaf by transpiration, but not before all the salts brought up from the soil have been deposited in some green part of the plant. This current of water—the transpiration-stream—must be kept up. No process going on in the plant is so readily influenced by external conditions as this very transpiration-stream. In order, therefore, to carry out this process, the plant body adapts itself in form and structure to all those external conditions, which have an influence, adverse or otherwise, on the transpiration-stream. On the one hand, therefore, we have the external conditions, and on the other hand the plant functions. In between is the plant body, which in form and structure is the result of the influence of those conditions on the carrying out of one of the vital processes of the plant body—the transpiration-stream. A community of plants which are similar in form and structure, owing to their living under similar conditions, is known as a plant formation.

The presence of any particular formation is due, in the first place, to the annual rainfall—that is to say, to a climatic condition. A heavy annual rainfall gives us woodland, less grassland, and still less desert. These three forms of vegetation are known as climatic formations. But a certain climatic formation covering a large area may be interrupted by another kind of formation on account of some peculiarity in or of the soil. A river traversing grassland may produce, by its large supply of

water, woodland on its banks. This woodland would be called an edaphic or local formation. It is the direct result of certain local conditions, namely, in this case the increase of water in the soil owing to the neighbourhood of the river.

We have now before us the completed English edition of Schimper's book, plant-geography upon a physiological basis, which, in the form of a text-book, contains a large number of observations by Schimper and numerous other biologists, which have some bearing on the influence of external conditions on plant-life.

Schimper at first enumerates and discusses those factors which in some way influence the production of definite plant formations, by affecting the carrying out of certain vital plant-functions. These factors are water, heat, light, air, soil, and animals. He then proceeds to describe the climatic or district, and edaphic or local formations, of each of which there are three types—woodland, grassland, desert. The third part of the book is devoted to the vegetation of the tropical, temperate, and arctic zones, and the regions of the mountain and water.

Schimper brings out three points very clearly in his book, which may be here quoted with advantage. "The type of *vegetation* in the tropical and temperate zones is determined by the amount and distribution of the *rainfall*, by the humidity of the air, and by the movements of the atmosphere, which essentially affect vegetation only by their desiccating influence." This refers to the plant formations.

Referring to the distribution of plant species, he says, "The type of the *flora*, in so far as it depends on existing factors, is dependent primarily on *heat*, especially if we consider, not the groups of lower order (genera and species), but those of higher order (cohorts, orders, and families)."

Lastly, "The differentiation of the world's vegetation is thus controlled by three factors—heat, atmospheric precipitation (including winds), soil."

The great importance to the geographer of this whole subject lies in the fact that the plant-formation is an expression of the influence of local conditions on plants, and it is thus a key to these conditions. From a study of the one we can draw conclusions as to the nature of the other. It is essential, for a proper description of scenery, that the traveller or explorer should have some knowledge of vegetation, as it forms such an important feature in nearly every landscape.

The book before us has been well translated and well published. Botanists and geographers owe the translator and the editors a debt of gratitude for the big task they have successfully mastered. The book is admirably illustrated. It is prefaced by an appreciation of the work of the author, whose premature and much-lamented death occurred in 1901.

O. V. D.

Sixteenth-century Geography.

'La Cosmographie avec l'espère et régime du Soleil et du Nord.' Par Jean Fonteneau dit Alphonse de Saintonge, Capitaine-pilote de François I^er^. Publiée et annotée par Georges Musset, Archiviste-paléographe, Correspondant du Ministère de l'Instruction publique et des Beaux-Arts. Paris: Ernest Leroux, 1904. (*Recueil de Voyages et de Documents pour servir à l'Histoire de la Géographie depuis le XIII^e^ jusqu'à la fin du XVI^e^ Siècle*, vol. xx.)

This last volume of an invaluable series will be found well-nigh as interesting as any of its predecessors. Its standard of scholarship and research is, perhaps, not as high as, for instance, that of Harrisse's 'Jean et Sebastian Cabot;' it appears to suffer occasionally from careless proof-reading; but it gives us a text of great value, with a useful introduction on the life of a fine old French sea-dog, and it is certain of a cordial welcome from all students of the history of exploration.

Alphonse de Saintonge, when he finished his *Cosmographie* in 1544, had, from

his own account, already been a seaman and traveller for forty-eight years—in other words, since 1496. During this half-century he had navigated both in the French and Portuguese services; he had visited almost all the points of the African and East Indian shores especially frequented by the 'Lusitanians;' and his connection with Portugal was at times so close that some have made him a subject of Emanuel the Fortunate and John III. On the other hand, he appears, with Roberval and Cartier, as a pioneer of French exploration and settlement in Lower Canada. In Europe, Alphonse was best acquainted with the coasts of France and the Iberian peninsula; next, with those of South England; least, perhaps, with the shores of the North sea, the Baltic, and the Archipelago (though at least one voyage in all these waters must be credited to him). But Ireland and Scotland, probably, were quite outside his personal knowledge.

The African sea-front he had examined in great detail, both on its Atlantic and Indian sides. He appears to have journeyed extensively in the Red sea, to have circumnavigated Madagascar, and to have visited not only the chief East Indian islands and various parts of China, but perhaps the north-west extremity of Australia, if we may attach this meaning to his *Continental Java*. Beyond Sumatra (his *Taprobane*), he also speaks of an island, 300 leagues long and 100 broad, stretching away towards Magellan straits; but though we are greatly tempted to find here another suggestion of the Austral continent, it may be Borneo that is intended.

Alphonse's language about a region with three months' daylight may refer to Davis straits, into which he seems to have penetrated in a search for the north-west passage. As to the West Indies, our pilot appears to have had a fair knowledge of most of the islands and continental shore-lands; in fact, we shall probably not exaggerate in considering him to have acquired a practical acquaintance, from personal experience, with nearly the whole Atlantic littoral of North and South America, from Davis to Magellan straits. From other sources Saintonge appears as a pirate at Porto Rico; as a witness to the sale of a Rochelle vessel (April 18, 1537); as the leader of the reinforcements sent by Roberval to Cartier's Canadian enterprise; as an explorer and temporary settler in the Gulf of Saint Lawrence (1541–3); as a seaman navigating—with the occasional relief of a little piracy—among the West African islands, and especially the Madeira group (1543); and finally as a corsair who perished in a last fatal voyage against his old enemies of Spain.

Besides the *Cosmographie*, in which Alphonse gives us an account of all the coasts he had surveyed, and of all the seas and lands that he had known or heard of ('de toutes les provinces de l'universal monde'), he was the author of at least two, and possibly of five, other works, the chief of which is the famous 'Voyages aventureux,' in which a *periplus* is given us, first of the west and north European shores, from Denmark to the Straits of Gibraltar, then of the eastern coast of America, from Labrador and Newfoundland to Magellan straits, and finally of the East Indian islands, of the South Asiatic Littoral, and of portions of 'Cathay,' Egypt, Ethiopia, and Guinea.

As to the invention of the *jeanette*, which M. Musset claims for Alphonse, 'le créateur du mat, de la vergue, et de la voile de perroquet' (p. 19), this will perhaps not be conceded without dispute, but certainly a good case is made out by the editor for his 'Pilote Saintongeais,' celebrated in quaint verse by Melin de Saint Gelays—

> "Alfonse ayant suivi plus de vingt et vingt ans
> Par mille et mille mers l'un et l'autre Neptune,
> Et souvent défié l'une et l'autre fortune,
>
> * * * * * *

Ore il tourne la voile à la faveur des vans,
En une heureuse route, à nul autre commune,
* * * * * *
Mais le *mas elevé en signe de son nom*
Elevera tousjours dans le Ciel son renom. . . ."

C. RAYMOND BEAZLEY.

THE MONTHLY RECORD.

EUROPE.

The Present State of European Limnology.—A painstaking and laborious compilation of all the results hitherto attained in Europe by the lake surveys of recent years has been made by Dr. W. Halbfass in the *Zeitschrift* of the Berlin Geographical Society (1903, Nos. 8, 9, 10; 1904, No. 3; also reprinted separately). The work will be useful both as bringing together into small compass a vast amount of *data* hitherto widely scattered, and as showing the exact state of our present knowledge of European lakes, and the gaps that remain to be filled before that knowledge can be in any way complete; for although a certain amount of limnological work may have escaped the author, there is little doubt that all the most important results have been included. The author divides the material according to countries, a subdivision into regions being made in the case of Germany before the final alphabetical arrangement of the lakes; and in the case of each of the latter the different elements (area, depth, volume, mean slope of sides, shore development, etc.) determined by the surveys are entered in tabular form. In all no fewer than 873 lakes are included, but the gaps in our knowledge are still very striking, especially as regards the lakes of northern Europe, though here there are already signs of improvement. The countries bordering on the Alps are the best known from a limnological point of view, though Sir John Murray's survey of British lakes will cause this country to take a high place. Many of the Alpine lakes require, however, more detailed examination. Spain is not rich in lakes, but a considerable amount of work awaits the doing, and the same is the case in Greece. On the other hand, the examination of the lakes of the more northern part of the Balkan peninsula is proceeding satisfactorily through the labours of Oestreich, Cvijić, etc. At the close of his paper, Dr. Halbfass groups together into five tables the lakes which stand at the head of the list in regard to certain special factors (depth, volume, etc.). Of 27 lakes which, so far as we yet know, attain a depth of 200 metres (656 feet) and over, 14 (including the four deepest) belong to the Scandinavian peninsula, 10 to the Alps or their borderlands, 2 to Scotland, 1 to Macedonia. All the deep lakes of Europe lie either on the margin of important mountain ranges or in regions of geological subsidences, and almost all the deepest occupy depressions reaching below sea-level. In Scotland and Norway many of the deepest lakes have their surfaces little above sea-level, and the difference between these and fjords is very slight. Of the high-level lakes (in regard to which much work still remains to be done), the deepest hitherto known seems to be the Lac Bleu in the Pyrenees (6457 feet above the sea), with a depth of 396 feet, but probably this may be exceeded in Norway. Both for volume and extent of shore-line, Onega takes the first place, the Scandinavian lakes Wener and Mälar following next, the first in respect of volume, the second of shore-line, while Mälar shows the greatest proportional development of shore-line of all the European lakes. For steepness of sides, the Königs-See

takes the highest place, Loch Katrine the second, among lakes which exceed one square kilometre in area.

The Flora of the Swabian Alb.—In *Engler's Botanischen Jahrbüchern*, Bd. 32, Heft 4–5, Dr. Aug. Schulz criticizes Gradmann's work, 'Das Pflanzenleben der Schwäbischen Alb.' The latter author states that a fraction of the present flora consisting of the northern group of species extending southwards from the Arctic seas, has existed on the Alb from the second and most extensive epoch of glaciation. That many northern species have been almost interruptedly present on the Alb during the interval Dr. Schulz admits, but denies that this was due to successive propagation, holding that, though these species exist in climates as different as those of the glacial epoch and the succeeding milder interval, they would die out before they had time to adapt themselves to the change. Certainly those which had adapted themselves to the climate of the interglacial period following the second glaciation would not survive the third glacial epoch. Dr. Schulz also objects to the conclusion that woods were more abundant in the third great glacial epoch than in the second, based on the present distribution of plants indigenous to the upper alpine regions, which he maintains was very different at the period of glaciation. Nor does he consider it certain that all the species of the Alb flora belonging to the above group migrated from the Jura. Many also of Gradmann's pre-Alpine group probably found their way to the Alb at the same time. According to Gradmann, the third glacial epoch, during which large tracts of the Alb had a character similar to that of the tundras of the present day, was followed almost immediately by a period in which steppes were extensively developed. This view is combated by the author, who affirms that Nehring and other writers have drawn wrong conclusions from the arrangement of animal and vegetable remains in the deposits of Schweizersbild and elsewhere, conclusions that would be true only if it could be proved that remains never found their way from one set of beds to another. During the coldest part of the later cold period (by some called the fourth glacial epoch) the regions of Central Europe which were bare of ice, could not, he says, have resembled the tundras of north-eastern Russia and Siberia, but had a climate somewhat similar to that of the coastlands of south-western Greenland. An investigation of the development of the present flora of middle Europe shows that the coldest period of the last glacial epoch was followed by periods when the climate was temperate and sometimes even warm, before the climate of middle Europe assumed a thorough continental character. First conifers, especially *Picea excelsa*, spread themselves over a great part of Central Europe; then followed a time when the beech (*Fagus silvatica*) was the prevailing tree. Then the summers became again cooler and damper and the winters milder; and afterwards the quantity and frequency of the precipitation diminished and the temperature rose (the period of the *Ancyclus* subsidence in the Baltic), the climate becoming at length similar to that of south-eastern Russia at the present time, and steppes came into existence in Central Europe for the first time. Once more the climate became severe, the glaciers of the Alps increased to no inconsiderable extent, and alpine plants wandered into regions that had become suited to their existence. Dr. Schulz has much to say regarding the effects of these changes of climate on the distribution of plants, and his essay is of great interest to botanists.

Ethnological Research in the Færoes.—A paper by Mr. Nelson Annandale, reprinted from the *Proceedings* of the Royal Society of Edinburgh (vol. xxv. part. i.), deals with the people of the Færoes. The first part deals wholly with the figures obtained by anthropometrical work on twenty subjects in Thorshavn, supplementing Dr. Förgensen's work, by which he was enabled to point out the difference between the inhabitants of Suderö and those of the northern isles. The

second part is historical, and the combination of anthropometry with the scanty history and the traditions available leads to the conclusion that "the people, descended in the main from ancestors whose blood was somewhat mixed, but chiefly Norse, have remained more or less isolated for about a thousand years, except for casual immigration of persons and parties, who were probably 'Celtic' or Iberian, and who, it is safe to say, came either from Scotland, from Ireland, or from the intermediate isles." This admixture has, in particular, given their distinction to the inhabitants of Suderö.

The Bolshezemelsk Tundra.—This name is given to the north-eastern portion of the Government of Arkhangelsk, between the Pechora in the west, and the Ural and the Pai-hoi mountains in the east. It is but very imperfectly known, and therefore a sketch of its surface geology by N. Karakash, based on the recent explorations by A. N. Zhuravski, and previous research (*Bulletin* of the Society of Naturalists at St. Petersburg, 1904, No. 3), is worth noticing. This part of the tundra does not consist of immense borderless marshes as the western portions of the great tundra do, known as the Kanin and the Timansk tundras; its surface is all covered, on the contrary, with mounds and low ranges of hills, reaching 100, and occasionally up to 200 feet. Thus the Bolvanskaya Sopka runs east and south-east from the Cape of the same name, with an altitude of about 100 feet, for some 13 miles; the Mokhnataya Sopka runs to the east from Cape Mokhnatyi, or Sokolka, joining in the east the Yushinskaya Sopka, 200 feet high, which runs as a narrow ridge, or rather as an *ås*, or kame, southwards, to join another narrow ridge, or kame, the Ortinskaya Sopka, running east-north-east from the mouth of the Ortina river. It is only between these low ranges that one finds flat spaces covered with marshes, rivulets, numerous small lakes, and small separate hills, or rather mounds. Here and there one sees spaces covered with the dwarf birch, *Betula nana*, and willows. All these mounds, hills, and low ranges consist of a tough boulder clay of morainic origin, occasionally covered with sands. M. Zhuravski has made an interesting collection of the boulders with which the boulder clay is filled, and it appears that they consist chiefly of granites, porphyrites, amphibolites, gneisses, talc and chloritic slates, sandstones, limestones, and so on. Many of the latter contain fossils, which have been determined as belonging to the Devonian, Carboniferous, Carbo-Permian (or Artinsk), Permian, and Jurassic deposits, such as are found on the western slopes of the Urals. The Upper Carboniferous deposits which are found on the Urals are represented by the greatest number of fossiliferous boulders. The Permian and the Jurassic boulders may have been brought from the south, where both are found on the Pechora, or else they may have originated from deposits of that age which may have covered the tundra, and have been destroyed by the ice-sheet. All these mounds and ridges are undoubtedly moraines, which have been washed on their superficies by water. As to traces of marine deposits, they have only been found near to the sea; but it is known that further west, in the Timanskaya tundra, deposits of the post-Glacial sea have been found up to a height of 120 metres (360 feet), and that this sea covered large spaces, penetrating southwards up the Pinega and the northern Dvina. This post-Glacial extension of the sea has fully been proved by the researches of Tchernysheff, Stuckenberg, Hertzenstein, and Bartot-de-Marny, while Amalitskiy saw also traces of an inter-glacial period, which, however, would require more detailed exploration to be proved.

ASIA.

Physical History of the Issik-kul Region.—The journey in Russian Central Asia undertaken in 1903 by a party from the United States, including Mr.

R. Pumpelly, Prof. Ellsworth Huntington, and Prof. W. M. Davis, has already been referred to in the *Journal*. Prof. Davis returned to America after the first season's work, while Messrs. Pumpelly and Huntington have continued their investigations, and the latter has sent us a valuable paper on the anthropogeography of the region, which will in due course be printed in the *Journal*. Meanwhile Prof. Davis has given, in the *Bulletin* of the American Geographical Society (1904, No. 4), an outline of last year's journey, which contains some interesting observations on the physical history of the region traversed. With regard to the Issik-kul, he discusses both the peculiar relation which exists between the lake and the river Chu, and the geological changes to which the former seems to have owed its origin. The lake (as has been known from the work of modern Russian travellers,* though both Humboldt and Ritter were mistaken as to the facts of the case) has no outlet, the river Chu flowing past its western end, and discharging some of its water *into* the lake by the short river Kutemaldi. Prof. Davis thinks that the slight amount of salinity of the lake-water is an indication that the Chu was once both an inlet and outlet from Issik-kul, the change being brought about by the river itself, which seems to have built a fan delta, which led to a chance diversion of its course. Several abandoned shore-lines may be traced around the lake, and there are evidences of both positive and negative changes of level in the past. A drowning of the valleys which debouch into the lake is strongly marked at the eastern end, and this is in agreement with the report that ruins of houses are to be seen beneath the waters in this direction. The lake-basin seems in genetic contrast to the uplift of the mountain blocks to the north and south, which occurred long enough ago for the formation by valley erosion of stony Piedmont waste slopes, which are several miles wide on each side. The mountains, especially the Alexander range to the west of the lake, appear to be tilted and carved fault-blocks, such as have been described by Gilbert and Russell for the Great Basin of Utah and Nevada. In the present forms of the Alexander range, there are indications of fracture and uplift on the north, accompanied by tilting and relative depression on the south. In the basin formed by this depression much of the waste brought down by the upper Chu, which would otherwise have filled up the western end of the lake much more than at present, appears to have been deposited. In the steep walls and rapid fall of the channel of the Boam defile Prof. Davis sees evidence of the sub-recent uplift that the Tian Shan must have suffered hereabouts. *En route* for Semipalatinsk he crossed a fine example of an undissected peneplain, which he is inclined to think once continuous with the uplifted peneplain on the back slopes of the mountains round Issik-kul; the difference between the strong relief of the Tian-Shan and the monotony of the bordering steppes being due to the invasion of the former by forces of deformation and uplift, while the latter remained quiescent.

Expedition in Perak and the Siamese Malay States.—In 1901–2 Messrs. Nelson Annandale and H. C. Robinson, under the auspices of the universities of Edinburgh and of Liverpool, undertook a journey in Perak and the Siamese Malay States, having anthropological and zoological studies for its object. The results are set forth under the title 'Fasciculi Malayenses' (Longmans). A supplementary part of this is issued to show the itinerary of the travellers, and is provided with an excellent map. Two months were spent in the Batang Padang district of Southern Perak, while both travellers also made journeys in the following states: Senggora, Patani, Jalor, Nawngchik, Jhering,

* See, *e.g.*, the report on the journey of Oshanin and Gramenitzki in *Proc. R.G.S.*, N.S., vol. x., 1888, pp. 638–646, with map.

and Kedah. Mr. Annandale undertook exploration by himself in Central Perak, Upper Perak, Patalung, Trang, and Rhaman; and Mr. Robinson in Selangor. This supplement is in the nature of a diary and description of the places visited, and also summarizes the principal points of the work of the travellers. It is illustrated with a few excellent photographs. One point of strictly geographical importance is to be noted. The travellers observed a very distinct break in the main mountain range of the peninsula in Central Kedah—that is to say, between 6° and 7° N. In crossing here no great elevation was reached, nor were high mountains seen. It is, therefore, apparent that the mountain fauna of Perak has no continuous distribution to-day with that of Northern India, and the travellers state that their whole collection has served to confirm the belief "that the Malay peninsula is connected with India, as regards zoo-geography, in a degree not much more intimate than that which links it to Borneo."

Recent Elevation in the Moluccas.—The section of Prof. K. Martin's recently completed account of his geological observations in the Moluccas which has most general interest is that devoted to the raised coral reefs, and the evidence they yield of recent elevation of the land. The conclusion come to is the same as was reached by Mr. Günther from his work in the Bay of Naples—that the facts are inexplicable on the hypothesis that the land has stood still, and the level of the sea has altered. Though there was no opportunity for close accuracy of measurement, the scale of the phenomena is great enough to render this unnecessary; for instance, according to Prof. Martin, the hills of Haruku and Saparua are only 1000 feet in height, and are free from coral reefs near their tops, while in the neighbouring island of Ambon the coral reefs rise to a height of 1600 feet, the difference being over 600 feet in height, and the horizontal distance 10 to 15 miles. The greatest elevation above sea at which old coral reefs were found by Prof. Martin falls considerably short of the 5235 feet (1586 metres) at which one was found by Dr. Verbeek in eastern Timor.

The Naledi of Siberia.—The phenomenon called a *naled* by the Russians, and a *tarin* by the Yakuts, is a flooding of a river-valley above the ice. It has been alluded to by many writers on the country, but, as the guides know well where *naledi* are formed, and naturally avoid places where the traveller may unexpectedly be plunged into an icy-cold bath and lose his sledge and baggage, few, if any, have had an opportunity of thoroughly investigating their process of development. M. S. A. Podyakonof, during three years spent in the Yakutsk province, has thoroughly examined the *naledi* among which his work lay, and has given a detailed account of them in the *Izvestiya* of the Russ. Geogr. Soc., No. 4, 1903. A favourable site for a *naled* is a section of the course of a small mountain-stream consisting of a hollow in the base rock filled up with alluvium. On the top lies a thin layer of moss or vegetable soil, and below it a layer of mud or clay, and below this again loose or only slightly cemented pebbles with a mixture of gravel and sometimes boulders. When the frost has covered the stream with a layer of ice which checks the flow of the water, the latter begins to soak into this permeable detritus, at first falling to a lower level, but soon rising again as the thickening of the ice still further contracts the channel, and at length makes its way to the surface at those places where there is no covering of ice owing to the dryness of the surface or to the protection of a mantle of snow. The water thus brought to the surface may flow for some time, soaking the snow, until at length it becomes frozen, and the *naled* then appears as a sheet of ice, above which rise hillocks and snow-drifts. As the winter passes on, the surface is raised by the outflow of more water and the fall of snow, so that ultimately all inequalities are obliterated. In the spring when the thaw sets in the water cuts small runnels in

the surface of the ice, gradually making its way down to the alluvium beneath, until the *naled* is fissured in all directions. Some ice often remains, however, till the height of summer, and reindeer resort to it for coolness and to escape the flies. On large rivers *naledi* are less common, but M. Podyakonof has observed them on the river Lena. The ice on the middle of the river is thrust upwards by the pressure of the water, and, pressing in its turn on the water, forces it out over the river-banks. This river flows northwards, and is frozen in the north while the autumn rains in the south are maintaining the flow of water in its bed. On rivers flowing southwards, as the Olekma, the water is checked in the north, and the ice below, from the absence of water sufficient to support it, sinks in the middle. M. Podyakonof describes several peculiarities of the *naledi*, among them blocks of ice raised above the general level and yet continuous with the surrounding ice. He attributes their formation to unequal freezing and expansion in hollows of the surface.

AMERICA.

Currents of the Newfoundland Coasts.—The Canadian Tidal and Current Survey continued its operations in 1903 on the southern and south-eastern coasts of Newfoundland, under the direction of Mr. W. Bell Dawson, and the results, which are of much interest from the light which they throw on the behaviour of currents in general in the neighbourhood of land masses, have been published this year at Ottawa by the Department of Marine and Fisheries. The primary object of the investigation was to ascertain what currents were to be met with by steamships following the usual route from Europe, and especially to elucidate the question of indraught into the large bays on the south coast, of which the largest, Placentia bay, is 75 miles deep and 45 miles wide. The results in regard to the polar current east of Cape Race are, however, of the most general interest. The system employed was to anchor the steamer (the *Gulnare*, 262 tons, of the Department of Marine and Fisheries) at carefully selected stations, and to make use of it as a fixed point from which the direction and speed of the current could be measured. This method possesses special advantages in a region so liable to fog as the one in question, where, if courses are run, long sights to fix the ends of these can rarely be had. The currents observed were almost invariably less than one knot, and as a rule they veered widely and were irregular in direction. A tidal element was found to be almost always present in some form, but with this is combined a tendency to make on the whole in some one direction. The effects of storms during summer seldom exercises a disturbing influence below 5 to 10 fathoms. On the south coast, when within 4 or 5 miles of the shore, the current is governed chiefly by the tide, and sets in the two opposite directions alternately. But the greater the distance out, the greater is the tendency to veer completely round the compass. Taking a long average, the set is most frequently north-westward along the south shore, from Cape Race toward Placentia bay, while on the eastern side of that bay the water on the whole makes inwards, and at certain times of the tide a corresponding indraught is felt on the east side of St. Mary's bay. These indraughts do not exceed one knot at an offing of 5 miles. The polar current sets very constantly to the south-west for a width of 30 to 40 miles off the eastern coast, but in times of disturbance (usually for part of a day preceding a gale), it may set south-eastward, or even be reversed, on the surface. Temperature observations showed (1) that the temperature of the water at 30 fathoms is practically at the freezing-point in all parts of this region, from the mouth of the Placentia bay to St. John's: it varied only from 30½° to 34° Fahr., and there was no seasonal change between May and September; (2) that the water of

the polar current warms up at the surface quite as much as the surface water elsewhere in this region, though whether this may be due to warmer water flowing over it from elsewhere could not be ascertained. Sudden changes in the temperature of the surface water resulted from wind disturbance. An indication of the general set of the current is supplied by the icebergs, which always move to the south-westward, even when the surface water, and with it the flat or pan ice, may set in quite a different direction under the influence of the wind.

The Bahamas.—The Blue-book for 1902 on the Bahamas furnishes, beyond the scope of the average official report, a comprehensive summary of their geography (including geology, climate, and meteorology), political history, and economic and cultural condition. The text is also illustrated by a map and thirty-two photographs of typical scenes and objects; while a bibliography is included. Altogether, the Report supplies an excellent basis for a general appreciation, reciprocally scientific and practical, of the islands. The islanders themselves, who have no cause to complain of fortune, might be well advised to study their Governor's judicious review of the situation and his suggestions towards its improvement. As adverse factors in this group of islands are enumerated—(1) scantiness of soil and defect of natural water-supply; (2) lack of adequate population, and their lack in turn of sufficient enterprise; (3) want of harbours to accommodate other than small craft; (4) want of regular steam-communication with the other islands. Among favourable factors, on the other hand, is the climate; delightful in winter, and even in summer, though hot, yet seldom oppressive. Nassau, though still without the usual sensational accompaniments of holiday resorts, is likely, by the mere attraction of its climate, scenery, and bathing facilities, to continue a favourite winter resort for dwellers on the adjacent continent, its climate being undoubtedly superior to that of any of the Florida resorts. Its one drawback is that it can be reached only by sea, and the voyage, though only of sixteen hours, has, owing to the necessities of draught at both ports, to be made in a vessel of restricted size. The attractions of Nassau are possessed more or less by numberless other spots, especially on the western side of the Exuma Cays. The Exuma Cays are, moreover, admirably suited to form sanatoria for consumptive patients. They are highly picturesque, and with proper arrangements and accommodation might be made very attractive to residents. On them malaria is a practical impossibility. Rainfall, moreover, is there much more limited than in the larger islands. Though not rising more than 100 feet above sea-level, none of the islands are quite flat. In the Bahamas generally, agriculture, scientifically pursued, repays effort. Sisal plantations especially, worked on proper lines, yield good results. The culture bids fair to be permanent and profitable, no other economic plant being so well suited as the agave to the peculiar conditions of the Bahamas. The sponge industry will continue to be a valuable means of support to the merchants and collectors. Charges of damage done to the beds by collection of immature specimens continue to be made, but so far no steps have been taken to correct the abuse. By a curious slip, Nassau, the capital, is, on p. 10, said to have received its name in compliment to the House of "Hanover" instead of Orange.

The British Guiana-Brazilian Boundary.—By the award of the King of Italy, given on June 15 last, the last of the questions at issue in regard to the boundaries of British Guiana—that with Brazil—has been finally set at rest. The decision is avowedly a compromise, for while holding that the guiding principle in the decision must be that of the acquirement of rights by definite acts of occupation or extension of influence, the arbitrator finds that in the case of the disputed territory it is impossible to define clearly the limits to which the influence of the two parties to the dispute has extended. He has therefore given preference

to such natural dividing lines which seem best to lend themselves to an equitable division of the territory. The line thus fixed starts from Mount Yakontipu, at the source of the Kotinga; runs east along the water-parting to the source of the Ireng or Mahu; follows this river down to its junction with the Takutu, which it ascends to its source, there joining the undisputed part of the frontier as fixed in November, 1901. It will be remembered that the British claim carried the frontier in its northern section along the Kotinga instead of the Ireng, and that the intervening strip is therefore gained by Brazil. On the other hand, the British claim is substantiated in the more southern section, where the Brazilian claim included the strip of territory between the Takutu and the Rupununi.

The Dutch on the Amazon.—In the *English Historical Review* for October last, Mr. George Edmundson elucidates a number of points in the history of the Dutch on the Amazon in the seventeenth century. Acquainted as early as 1580 with the Brazilian coast, the Dutch had, by the end of the sixteenth century, erected two fortified trading stations, Orange and Nassau, on the Xingu. In 1605, as we learn from Purchas's 'Pilgrims,' one of the English colonists settled at Wiapoco reported the presence of three Dutch vessels on the Amazon. One of them, the *Hope*, trading under an English captain for Amsterdam merchants, he found to be on a six months' visit to Wiapoco, where it had been the year before. Writing April 4, 1615, to the Council of the Indies, the Duke of Lerma reported, evidently on the testimony of an agent in Spanish pay at the Hague, the return from the Wiapoco of a captain of the Flushing fleet and his son. There they had erected two houses, cultivated tobacco, and made a cruise of 100 leagues up the river. The report further notes a commercial company of Flushing, headed by its burgomaster, asking aid of the Estates of Holland to explore the whole length and breadth of the Amazon. In 1614 the Estates of Holland had offered a limited monopoly to pioneers in foreign settlements. These early settlements on the Amazon are described, now as English and now as Dutch, because the settlers from the cautionary towns (Flushing, etc.) included a considerable intermixture of English. Before the end of 1616 the Dutch had one settlement on the Essequibo and another on the Amazon. A well-authenticated account of both is contained in the manuscripts of Major John Scott. The eye-witness from whom Scott draws his information about the Amazon settlement figures in the manuscript as "Vuyler"—a clerical misreading under which Mr. Edmundson recognizes the famous Admiral de Ruyter. Dutch enterprise on the Amazon did not long enjoy the favour of fortune. In the early part of 1623 Maciel Parente, Captain-General of Grão Pará, a man of uncommon energy, ousted the Dutch from Corupá station (north bank of main stream, near mouth of Corupá) and from the Xingú, and built a fort at Corupá opposite the former Dutch post. In November of the same year Peter Jansz of Flushing drove the Portuguese garrison out of Corupá. Next, Captain Oudaen was sent by the West Indian Company to establish himself firmly at this critical point of vantage. Dutch ambition on the Amazon received its final blow when a powerful fleet under Pedro Teixeira swept the Dutch out of Corupá. The entries of trading on the Amazon disappear in 1628 from the Zeeland Chamber's minutes of proceedings, as also from De Laet's *Jaerlijck Verhaal*. What desultory Dutch trading still lingered after 1629 was confined to the immediate neighbourhood of the Cabo do Norte.

Old Cartography of the North Coast of Brazil.—In connection with the tercentenary of the first settlement of the state of Ceara, Dr. O. A. Derby has made a study of the early maps of this coast and the voyages on the results of which they were based. He has embodied the results in the memorial volume published by the Ceara Historical Institute, and a translation of his paper

appeared in *Science* for April 29 last. The earliest map to show this coast is of course that of Juan de la Cosa, which was based not only on the voyage of Hojeda (1499), in which that pilot took part, but apparently on the voyages of Pinzon and Lepe shortly afterwards, as the nomenclature is fairly full for the coast between the Orinoco and Cape San Roque. Dr. Derby thinks that the Cape Santa Maria of Pinzon was some point to the west of the latter, whereas it may be remembered that some writers have identified it with Cape São Augustinho, the most easterly point of South America. He thinks, however, that it was rather Lepe's than Pinzon's voyage that inspired the nomenclature of this part of the map. The Cantino map of 1502 shows here a very scanty nomenclature, but new data appear on the maps of Freducci (about 1514 ?), Maiollo (1519), and the anonymous map of 1523, known as the Turin map. The last-named would seem to be based on a Portuguese voyage, of which the record is lost, and the data given by it did not become part of the general knowledge of the time. With regard to the name Maranon (which appears on the Freducci map to the east of the Amazon mouth), Dr. Derby thinks that it was given, either by Lepe or by some navigator of whom we have no knowledge, to a topographical feature of the coast of Maranhão, and was afterwards transferred to the Amazon by a mistaken identification. He points out that the name (which often has the article *o* prefixed) may be a corruption of o Marachão (a barrier of sand or gravel)—a term which would apply well to this coast. In favour of the idea that the name was due to another expedition than Lepe's, he quotes the letter of Estevão Froes, witten in 1514, in which reference is made to a previous voyage by João Coelho (identified by Dr. Derby with the João de Lisboa, known to have been a pilot about this time, whose name is associated with this coast in a series of later maps). As Froes made his voyage in company with Francisco and Pero Corso, and speaks of having found a certain Pero Gallego living with the Indians of the coast in question, we have a probable explanation of the Cape Corso and Rio Pero found on the Maiollo map. The maps of 1527 and 1529 (the latter, and probably the former also, by Diego Ribero) did not add to the stock of knowledge of this part of Brazil, but from 1534 onwards we find a number of maps, including those of Gaspar Viegas, Alonso de Santa Cruz, Sebastian Cabot, Diego Gutierrez, Diogo and André. Homem, and others, on which a new and more accurate topography of this part of the coast appears. It is marked especially by the excellence of its delineation of the hydrographical basin of Maranhão, and is attributed by Dr. Derby to the voyage, in 1531, of Diogo Leite, who may possibly have found the Pero Gallego of Froes still living on the coast, and obtained the information from him. Another feature in these maps is their mistaken notions regarding the Amazon, which was for a time suppressed entirely, and afterwards inserted erroneously. From about 1560 onwards the maps were marked by an imaginary representation of the interior, the lakes and rivers of which, shown by Gutierrez in 1562, found their way into the atlases of Ortelius, Mercator, and their successors.

AUSTRALASIA AND PACIFIC ISLANDS.

Midway Islands, North Pacific.—The Rev. A. B. Weymouth sends us from Lahaina, in Hawaii, some notes on Midway islands, supplied by Mr. S. Macmichael, one of the fifteen persons regularly stationed on the islands, which are situated some distance to the west-north-west of the main Hawaiian group in about 28° 13′ N., 177° 21′ 30″ W. They are the site of a cable station, and the inhabitants consist of the superintendent and his wife, the assistant-superintendent, four cable operators, a doctor, batteryman, four Chinese servants, and two labourers. There are two islands in the group—Eastern island, about one

mile long by half broad, covered with coarse grass and small shrubs; and Sand island, 1¾ mile long by one mile broad, consisting almost entirely of pure sand except at the two ends. The highest point is Observation hill on Sand island, 30 feet above sea-level. Good water is found on this island at a depth of 5 or 6 feet, but, owing to the amount of drifting sand, attempts at cultivation have met with slight success, though rather more on Eastern island. There are no native animals on either island, but innumerable sea-birds of some twenty species, besides a small number of curlew and plover. There are some small "wingless" birds on Eastern island, brought some years ago from Laysan, another isolated island in this part of the Pacific. Steamers do not call regularly, and during the winter storms it is uncertain whether boats can reach the shore. The climate seems colder than at Honolulu, and winter temperatures as low as 57° have been registered.

POLAR REGIONS.

Bénard's proposed North Polar Expedition.—In the middle of June a conference was held in Paris, under the presidency of the Prince of Monaco, to discuss a new polar expedition, planned by Mr. Charles Bénard, President of the Oceanographical Society of Bordeaux. Mr. Bénard, whose plans are put forward at length in a recent number of the *Bulletin* of the Monaco Oceanographic Museum, urges that the number of yearly journeys to definite regions should be increased, and cites the good work accomplished by the Danes in Greenland during the last thirty years as an example of what can be done in this way. At the same time he desires that a strenuous effort should be made to explore the unknown polar sea, by repeating Nansen's voyage with two ships, starting at about 150° E., *i.e.* further east than Nansen did. The two vessels would keep about 100 miles apart, and be in constant communication with each other by wireless telegraphy. The expedition would probably last three years, but both ships would be provisioned for five.

The Ziegler Arctic Expedition.—As the *America*, the ship of the Ziegler Expedition, under the command of A. Fiala, which went to Franz Josef Land last autumn, has not returned, it is surmised that, owing to the unfavourable ice-conditions of last year it may not have reached its goal, but have been caught in the ice. Mr. Ziegler has bought a Norwegian steam-whaler, and sent it to discover the whereabouts of the *America* and to carry provisions to the expedition, which was to have wintered in Teplitz bay. Mr. Champ is leader, and the ship started from Tromsö on April 1.

The Danish Expedition to North Greenland.—It is announced in *Petermanns Mitteilungen* (No. vi., 1904) that Mylius Erichsen and his companions, Count Moltke and Mr. Rasmussen of the Danish Expedition to North Greenland, about whose fate some concern had been felt, spent several months in Saunders island, in the north of Baffin's bay, with the natives under straitened conditions. On January 20 they started on snow-shoes for the south, crossed Melville bay, and reached Upernivik in safety. They will remain in Greenland all summer, and return with the last ship to Europe. For the first time in this way the Cape York Eskimo have been brought into touch with their relations in North Greenland.

Return of the "Scotia."—The *Scotia*, with Mr. Bruce and the members of the Scottish Antarctic Expedition on board, arrived safely in the Clyde on July 21, receiving a warm welcome. A telegram of congratulation from the King was read by Sir John Murray, and similar telegrams were received from Sir Clements Markham and others interested in the expedition. The gold medal of the Scottish Geographical Society was presented to Mr. Bruce by Sir John Murray, a gold watch-seal being also presented to Captain Robertson.

Ellesmere Land.—In a communication dated June 8 last, the Secretary to the Geographic Board of Canada informs us that the board has adopted the name "Ellesmere Land" for the large insular area in the Arctic region situated, approximately, between 76° and 84° N., and between 62° and 90° W. The name has hitherto been generally applied to the more southern portion only, but now that it has been definitely ascertained that the land forms one undivided mass, it is fitting that one name should designate the whole, though possibly the form "Ellesmere Island" might have been preferable.

The Fossil Flora of the Antarctic.—Dr. Nathorst has lately communicated to the Paris Academy of Sciences (*Comptes Rendus*, June 6, 1904) a note on the recent discoveries, by members of the Swedish Antarctic Expedition, of fossil plants dating from Jurassic and Tertiary times. The most interesting find, it will be remembered, was that made by Dr. J. G. Andersson at Hope bay in Louis Philippe Land (63° 15′ S., 57° W.), where a Jurassic flora, very rich in species and with the leaves well preserved, was found in a black schistose formation, forming part of an old range of mountains and attaining a thickness of some 2000 feet. Besides Equisetineæ, ferns, etc., the remains include species of conifers, and the general character of the flora resembles that of the Jurassic flora of Europe and of the Upper Gondwana of India. No climatic differences from either of these can be distinguished, and from this point of view the collection might equally well have been made on the coast of Yorkshire. The Tertiary remains were found on Seymour island in about 64° 15′ S., where Captain Larsen had already, in 1893, obtained specimens of fossil wood, recognized by English geologists as belonging to a conifer, as well as other remains, among which Dr. Andersson had recognized an Angiosperm. Among those recently discovered, which occurred in a marine volcanic tuff, Dr. Andersson has recognized specimens of a conifer resembling at first sight a *Sequoia*, though probably belonging to another genus; an *Araucaria*, apparently allied to *A. Braziliensis*; and certain Dicotyledonous plants with small leaves, corresponding with those of certain Tertiary floras of Southern Europe. Especially interesting is the occurrence of leaves of a *Fagus*, which genus must therefore, it seems, have existed either here or in South America since the beginning of the Tertiary epoch. Dr. Andersson points out the need of caution in drawing conclusions, from these remains, regarding the climate of the Antarctic Regions in those times, the formation in which they occur being marine in origin, while Prof. Agassiz has obtained leaves, wood, and fruits from the ocean bottom over 600 miles from the nearest land.

GENERAL.

The Eighth International Geographical Congress.—An announcement dated June, 1904, gives further details of the arrangements for the Washington meeting of the International Geographic Congress. Although the general programme has already been summarized in the *Journal*, it may be useful to those purposing to take part in the Congress to recapitulate somewhat, in order to present a more or less complete outline of the proposed proceedings. After assembling informally in Washington on the evening of September 7, the Congress will formally "convene" on Thursday, September 8, at 10 o'clock. It will reconvene in Philadelphia on Monday, September 12, at 9 o'clock; and again in New York, Tuesday, September 13, at 10 o'clock. After a field meeting at Niagara Falls, on Friday, September 16, it will reassemble in Chicago on Saturday, September 17, at 10 o'clock; and will finally meet in St. Louis, in conjunction with the International Congress of Science and Arts, on Monday, September 19, at 10 o'clock. The meetings will be classified as—(1) General Sessions, usually held in the forenoon;

(2) Sectional Meetings, usually afternoon; (3) Field Meetings; (4) Evening Lectures; and (5) Social Gatherings. Until September 7, the office of the Congress will be in the Hubbard Memorial Hall (National Geographic Society), corner of 16th and M Streets, N.W., Washington. On that day the records will be transferred to the Ebbitt House, 14th and F Streets, N.W., and this hotel will remain the headquarters during the stay in Washington. On September 12 an office for registration will be opened at the headquarters of the Geographical Society of Philadelphia, 1520, Chestnut Street, and on the morning of the 13th in New York at the American Geographical Society building, 15 West 81st Street, which will be the headquarters during the stay in that city. On September 17 an office will be opened in Cobb Hall, University of Chicago, and on the morning of the 19th in the Hall of Congresses, St. Louis Exposition. On Saturday, September 24, the headquarters will be once more transferred to the Hubbard Memorial Hall, Washington, where all correspondence should be directed down to the final closing of the Congress. Persons taking part in the meeting are requested to register on the earliest possible date at the local headquarters of the city in which they first attend the Congress, those who join at Washington being, especially, asked to be prompt in recording their names and local addresses. The following programme of the meeting has been provisionally arranged: *September* 7—Evening, informal reception by the National Geographic Society. *September* 8—10 a.m., formal opening in the George Washington (Columbian) University Hall, 15th and H Streets; 2.30 p.m., visits to Scientific Bureaus; 8 p.m., lecture. *September* 9—10 a.m., General session, devoted especially to Government surveys; 2.30 p.m., Sectional meetings; 5 p.m., reception by Mrs. G. G. Hubbard; 8 p.m., lecture by Dr. Von Drygalski. *September* 10—Sectional meetings; reception by President and Mrs. Peary (8 p.m.). *September* 11—Water excursion on lower Potomac; 7 p.m., start for Philadelphia. *September* 12—Visits to Philadelphia Institutions; field meeting in Fairmount Park; subscription dinner to foreign guests; start for New York. *September* 13—General session, devoted to Oceanography, introduced by an address from Sir John Murray; sectional meetings; public lecture (8 p.m.); reception by American Geographical Society. *September* 14—Sectiona meetings, in the afternoon devoted to Commercial Geography. *September* 15—Excursion up the Hudson, with field meeting on Mount Beacon. *September* 16—Field meeting at Niagara Falls, with address by Mr. G. K. Gilbert, etc. *September* 17—Arrival at Chicago (8 a.m.); general session at Cobb Hall; visits to institutions; reception by Geographical Society (8 p.m.). *September* 18—Excursion to view lake-front (provisional); start for St. Louis (10 p.m.). *September* 19—Arrival at St. Louis (8 a.m.); meeting with World's Congress of Science and Arts (10 a.m.); inspection of exhibits. *September* 20 and 21—Meetings with World's Congress; lecture by Commander Peary (8 p.m. on 20th). *September* 22—Formal session closing the Congress. Special transportation rates have been arranged, that from Washington to New York being $5, and from New York to Chicago and St. Louis and back, including sleeping-car and meals during outward journey, $45. The cost of the Far West excursion, which will leave St. Louis on September 24, and occupy twelve to fourteen days, will be approximately $150. As already announced, membership is acquired by members of geographical and cognate sccieties on payment of $5 (£1); by other persons, on a similar payment and election by the Presidency. Ladies and minors accompanying members may be registered as associates on payment of half the above sum, and they enjoy all privileges except the right of voting and receiving publications. The list of papers offered down to June 1 numbers some two hundred, many of the foremost geographers both of America and Europe being represented.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1903-1904.

Fifteenth Ordinary Meeting, June 27, 1904.—Sir CLEMENTS MARKHAM, K.C.B., F.R.S., President, in the Chair.

ELECTIONS.—*L. S. Coke (Irish Guards); Arthur C. Cooke; Captain E. E. Edlmann, D.S.O., R.A.; Frederick Anthony Floyer, B.A., M.B., Camb.; Wm. McLaren, M.A., B.Sc.; Percy Falcke Marks; Thomas Lillis Molony; Captain E. Mackenzie Murray (3rd Black Watch); Ambrose Petrocokino; Augustus Racester.*

HONORARY CORRESPONDING MEMBERS.

Senhor Augusto Ribeiro, Head of the Political Department, Portuguese Colonial Office; Dr. Don Eulogio Delgado, President of the Lima Geographical Society.

The Paper read was:—

"The Anglo-French Boundary Commission in Nigeria." By Colonel G. S. McD. Elliot, R.E.

A series of photographs of Lhasa and its Neighbourhood, taken by recent Russian visitors to Tibet, were exhibited on the lantern screen by the President.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps. *B.S.G. Italiana* **5** (1904): 13–34, 92–112, 193–223. **Marinelli.**
Studi Orografici nelle Alpi Orientali. Per Olinto Marinelli. *Illustrations.*

Alps—Monte Rosa. *Atti R.A. Lincei, Rendiconti* **13** (1) (1904): 400–408. **Oddone.**
Per lo studio della temperatura dell' aria alla sommità del Monte Rosa. Nota di E. Oddone.

Austria Hungary—Budapest. **Körösy and Thirring.**
Die Hauptstadt Budapest im Jahre 1901. Von Dr. Josef v. Körösy und Dr. Gustav

Thirring. I. Band, I. Hälfte. (Publ. des Statistischen Bureaus, Budapest, xxxiii. I. i.) Berlin, 1903. Size 11 × 7½, pp. 62. *Map.*

Ems—Ports. **Beekman.**
Tijds. Konink. Neder. Aardrijk. Genoots. 2de Ser. **21** (1904): 311–338.
De Havens van Emden en Delfzijl. Door A. A. Beekman. *Maps.*

Europe—Lakes. **Halbfass.**
Z. Ges. Erdk. Berlin (1903): 592–623, 706–729, 784–813; (1904): 204–223.
Die Morphometrie der Europäischen Seen. Von Prof. Dr. W. Halbfass. *Also separate copy presented by the Author.* [See note in Monthly Record, *ante.*]

France—Ancient Districts. *B.G. Histor. et Descript.* (1903): 236–238. **Saint-Jours.**
Limite des différents Pays (Pagi) de la Gironde à la Bidassoa. Par M. Saint-Jours.

France—Gascony—Shingle Beds. *B.G. Histor. et Descript.* (1903): 189–217. **Fabre.**
Les Galets des Plages Gasconnes. La Pénéplaine Landaise. Par M. L.-A. Fabre.

France—Landes. *B.G. Histor. et Descript.* (1903): 274–289. **Duffart.**
La Carte Manuscrite de Claude Masse (Fin du XVIIIe Siècle). Sa Valeur Scientifique. Principales Modifications du Sol Landais qu'elle révèle. Par M. Charles Duffart.

France—Lys. *B.S.G. Lille* **41** (1904): 266–272. **Malotet.**
La plaine de la Lys en France. Par A. Malotet.

France—Médoc. *B.G. Histor. et Descript.* (1903): 323–369. **Pawlowski.**
Les Villes Disparues et la Côte du pays de Médoc, d'après la Géologie, la Cartographie et l'Histoire. Par M. Auguste Pawlowski.

France—Neste. *B.G. Histor. et Descript.* (1903): 308–317. **Marsan.**
La Neste autrefois et aujourd'hui. Par l'Abbé F. Marsan.
The Neste is a left-bank tributary of the Garonne.

France—Roman Roads. *B.R.S.G. Madrid* **46** (1904): 59–67. **Blázquez.**
Estudio acerca de algunas vias romanas en Francia. Por A. Blazquez. *With Map.*

Germany—Geodesy.
Veröffentlichung des Königl. Preussischen Geodätischen Institutes. N. F. No. 15. Astronomisch-Geodätische Arbeiten I. Ordnung. Bestimmung der Längendifferenz Potsdam—Greenwich im Jahre 1903. Berlin: P. Stankiewicz, 1904. Size 11½ × 9, pp. 78. *Plate.*

Germany—Northern Plain. **Baren.**
Tijds. K. Ned. Aardr. Genoots. Amsterdam **21** (1904): 453–477.
De morphologische bouw der Noord-Duitsche laagvlakte. Door J. van Baren.

Germany—Silesia—Zobtenberg. *Globus* **85** (1904): 85–89. **Lustig.**
Die Trichter-Gruben (Mardellen) vom Zobtenberge in Schlesien. Von Dr. Georg Lustig. *Illustrations.*

Greece—Thessaly. **Merlin.**
Trade and Agriculture of the Province of Thessaly for the year 1903. Foreign Office, Annual No. 3148, 1904. Size 9½ × 6½, pp. 26. *Price* 2*d.*

Italy—Naples and Sicily. **Haas.**
Neapel, seine Umgebung und Sizilien. Von Prof. Dr. H. Haas. (Land und Leute. Monographien zur Erdkunde . . . herausgegeben von A. Scobel. xvii.) Bielefeld und Leipzig: Velhagen & Klasing, 1904. Size 10½ × 7, pp. 194. *Maps and Illustrations. Price* 4 *m.*

Portugal—Cartography. *B.S.G. Lisboa* **21** (1903): 451–460. **D'Eça.**
A Cartographia Maritima Portugueza e os seus Antecedentes. Por Vicente Almeida d'Eça.

Rhine. *Tijds. K. Nederl. Aardr. Genoots.* **21** (1904): 364–368. **Lorié.**
De vorming van het Rijndal. Door Dr. J. Lorié.

Rumania. *C. Rd.* **138** (1904): 1058–1060. **Martonne.**
Sur l'évolution du relief du plateau de Mehedinti (Roumanie). Note de E. de Martonne.

Russia—Gravity. *Iz. Imp. Russian G.S.* **39** (1903): 295–304. **Drubiago.**
Determinations of Gravity in the Urals carried out at the Kazan Astronomical Observatory in 1899, 1900, and 1902. By D. T. Drubiago. [In Russian.]

Russia—Murman Coast. **Breitfuss.**

L. L. Breitfuss. Expedition für wissenschaftlich-praktische Untersuchungen an der Murman-Küste. Bericht über die Thätigkeit pro 1902. [In Russian.] St. Petersburg, 1903. Size 12 × 8½, pp. x., 328, and 218. *Maps and Illustrations. Presented by M. L. L. Breitfuss.*

Russia—Volga and Caucasus. **Rossmässler**

Deutsch. Rundschau G. **26** (1904): 199-205, 255-264, 315-318.

Völkerkundliche Skizzen aus dem Gebiete der Wolga und des Kaukasus. Von F. Rossmässler. *With Illustrations.*

Servia. **Kanitz.**

Felix Kanitz. Das Königreich Serbien und das Serbenvolk von der Römerzeit bis zur Gegenwart. Erster Band. Land und Bevölkerung. Leipzig: B. Meyer, 1904. Size 11 × 7½, pp. xiv. and 656. *Illustrations. Price* 20*s.*

This work is to be completed in three volumes, the manuscript of the whole having been made ready for the press before the author's death in January last. Of the present volume, the opening chapters give a sketch of Servian history, while the remainder supplies a detailed description of the country in the form of itineraries.

South-Eastern Europe. **Richardson.**

Vacation Days in Greece. By R. B. Richardson. London: Smith, Elder & Co., 1903. Size 8½ × 5½, pp. xiv. and 240. *Maps and Illustrations. Price* 7*s.* 6*d. Presented by the Publishers.*

Accounts of journeys in Greece, Sicily, and Dalmatia by a former director of the American School of Archæology at Athens. In Greece, the routes led frequently off the beaten paths, and the narrative presents a vivid picture of parts of the country little visited by tourists.

Sweden. *Ymer* **24** (1904): 17-42. **Conwentz.**

Om skydd åt det naturliga landskapet jämte dess växt- och djurvärld, särskildt i Sverige. Af H. Conwentz. *With Maps and Illustrations.*

On the protection of natural landscapes, with the associated plant and animal life.

ASIA.

Asia—Yezidis. *S.G. l'Est* **24** (1903): 281-306, 429-445. **Perdrizet.**

Documents du XVII^e^ Siècle relatifs aux Ye'zidis. Publiés par Paul Perdrizet.

Baluchistan. *J. Asiatic S. Bengal* **72** Pt. iii. (1903): 53-60, 66-71, 72-80. **Rai.**

Note about certain sections of the Kakars living in the Zhob District of Baluchistan. Collected by Rai Sahib Diwan Jamiat Rai.
Notes on the Hindus in the Nushkī Tahsil of the Chagāī Agency in Baluchistan. By the same.
Notes about the Wanēcīs (Spin Tarīn Afghāns) of the Shahrig Thasil, Thal-Chotiali, Baluchistan. By the same.

Caspian Sea. **Spinder and Lebedintseff.**

The Work of the Karabugaz Expedition. Report to the Russian Ministry of Agriculture and Domains. 1. Hydrology, by T. B. Spindler. 2. Chemistry, by A. A. Lebedintseff. Size 10 × 7, pp. 177. St. Petersburg, 1902. [In Russian.]

Noticed in vol. xxiii. p. 500.

Central Asia. *Zap. Imp. Russian G.S., General G.* **38** (1903): No. 1. ——

From India to Ferghana. Description of a Journey made in 1898. By V. F. Novitsky. St. Petersburg, 1903. Size 10 × 7, pp. 297. *Map and Plates.* [In Russian.]

Noticed in the *Journal* for April, 1904 (p. 501).

Ceylon—Pearl Fishery. **Thurn.**

A Sketch of the Ceylon Pearl Fishery of 1903. By Everard im Thurn. Size 9½ × 6, pp. 10. *Presented by the Author.*

China. *Verh. Deuts. Kolon. Ges., Abt. Berlin-Charlottenburg* **8** (1904): 1-29. **Franke.**

Geistige Strömungen im heutigen China. Von Dr. O. Franke. *Presented by Dietrich Reimer, Berlin.*

On the tendency of ideas in present-day China.

China. **Madrolle.**

Madrolle. Chine du Nord et de l'Ouest, Corée, le Transsibérien. Pp. xii., 144, 38,

and 68. *Maps and Plans.* Ditto. Chine du Sud et de l'Est. Paris: Comité de l'Asie Française, 1904. Size 7 × 4½, pp. xii., 12, cviii., and 156. *Maps and Plans. Price, each vol.*, 12 *fr.*

The first attempt at a systematic guide to travellers in China, which should prove of much use. The books include sketches of Chinese history and literature, and an elementary grammar of the language, in addition to the usual practical directions with regard to routes, etc.

Eastern Asia—Sailing Directions.

Sailing Directions for Japan, Korea, and adjacent seas, from Yalu River, the boundary between Korea and China, to the Komandorski Islands; also the Ogasawara (Bonin) Islands, etc., southward of Japan, and the Kuril Islands. Formerly published as China Sea Directory, vol. iv. First Edition. London: J. D. Potter, 1904. Size 9½ × 6, pp. xxvi. and 864. *Index Maps. Price* 5*s. Presented by the Admiralty.*

French Indo-China. *B. Comité l'Asie Française* **3** (1904): 176–182. **Madrolle.**

Le Royaume de Luang-Prabang et le Traité Franco-Siamois. Par C. Madrolle. *With Map.*

French Indo-China—Annam. **Gosselin.**

Captaine Ch. Gosselin. L'Empire d'Annam, Préface de Pierre Baudin. Paris: Perrin et Cie, 1904. Size 8 × 5½, pp. xxvi. and 560. *Map. Price* 3*s.* 9*d.*

A useful summary of the history of Annam, both under its native rulers and under the French occupation.

French Indo-China—Tonkin. **Baldinotti.**

B. l'École Française d'Extrême-Orient **3** (1903): 71–78.

La Relation sur le Tonkin du P. Baldinotti.

India. **Connor.**

Trigonometrical Branch, Survey of India. Spirit-levelled Heights, Bengal and Assam. Seasons 1899–1902. Prepared by E. J. Connor. Dehra Dun: 1903. Size 10 × 6, pp. xii. and 74. *Map.*

India—Irrigation. **Wilson.**

Irrigation in India (Second Edition). By H. M. Wilson. (United States Geological Survey, Water-Supply and Irrigation Paper No. 87.) Washington, 1903. Size 9½ × 6, pp. 238. *Map, Plans, and Illustrations.*

A carefully revised edition of the original report issued in 1891.

India—Karakoram. *La G., B.S.G. Paris* **9** (1904): 249–256. **Bullock-Workman.**

Exploration des Glaciers du Kara-Korum. Par Fanny Bullock-Workman. *With Illustrations.*

India—Meteorology. *J. Asiatic S. Bengal* **72**, Pt. ii. (1903): 239–251. **Little.**

Himalayan Summer Storms and their Influence on Monsoon Rainfall in Northern India. By C. Little.

India—Pāṭaliputra. **Waddell.**

Report on the Excavations at Pāṭaliputra (Patna), the Palibothra of the Greeks. By L. A. Waddell. Calcutta: 1903. Size 10 × 6½, pp. 84. *Plans and Plates. Presented by the Bengal Government.*

Includes a sketch of the history of the ancient Pataliputra, an account of the discovery of the site, and descriptions of the ancient buildings and sculptures of Asoka's time.

India—Punjab. *Records Geolog. Surv. India* **31** (1904): 9–34. **Simpson.**

Report on the Coal Deposits of Isa Khel, Mianwali, Punjab. By R. R. Simpson. *With Maps.*

Korea. *Tour du Monde* **10** (1904): 133–156. **Hagen.**

Un Voyage en Corée. Par Dr. A. Hagen. *Illustrations.*

Malay Archipelago—Java. **Van der Heide.**

Tijds. K. Ned. Aardr. Genoots. Amsterdam **21** (1904): 203–226.

Aanteekeningen betreffende het kratermeer op de Kloet in verband met de uitbarsting op 23 Mei 1901. Door J. Howan van der Heide. *With Plates.*

Malay Archipelago—Moluccas. **Martin.**

Reisen in den Molukken, in Ambon, den Uliassern, Seran (Ceram) und Buru. Eine Schilderung von Land und Leuten. Von K. Martin. Leiden: E. J. Brill

1894. Size 11 × 7½, pp. xviii. and 404. *Map and Plates (separate)*: Ditto. Geologischer Theil. Von K. Martin. Leiden: E. J. Brill, 1903. Size 11 × 7½, pp. viii. and 296. *Maps and Plates.*

Malay Archipelago—Siboga Expedition. **Weber and Tydeman.**
Ann. Hydrographie **32** (1904): 97–107.

Die niederländische Tiefsee-Expedition auf der *Siboga*. Nach Prof. M. Weber und F.-Kapt. G. F. Tydeman. Bearbeitet von Dr. Gerhard Schott.

Manchuria. *J. R. United Service I.* **48** (1904): 533–540. **Beresford.**

Manchuria and Port Arthur. By Colonel C. E. de la Poer Beresford.

Manchuria. **Orloff.**

Die Eroberung der Mandschurei durch die Transbaikal-Kosaken im Jahre 1900, von N. A. Orloff. Deutsch von Ullrich. Strassburg i. E.: Wolstein und Teilhaber, 1904. Size 8½ × 5½, pp. 206. *Map. Price 3s. 8d.*

Manchuria. **Ullrich.**

Die Mandschurei, nach dem vom Russischen grossen Generalstabe herausgegebenen "Material zur Geographie Asiens." Uebersetzt von R. Ullrich. Berlin: K. Siegismund, 1904. Size 9 × 6½, pp. 52. *Map. Price 1s.*

Manchuria—Port Arthur. *Nineteenth Century* **55** (1904): 618–629. **Longford.**

The History of Port Arthur. By J. H. Longford.

Persia—Ornithology. **Zarudnyi.**
Zap. Imp. Russian G.S., General G. **36** (1903): No. 2.

Birds in Eastern Persia. Ornithological results of a journey in Eastern Persia in 1898. By N. Zarudnyi. Size 10 × 6½, pp. 467. St. Petersburg, 1903. *Illustrations.* [In Russian.]

See review, *ante*, p. 83.

Persian Gulf. *Contemporary Rev.* **85** (1904): 480–486. **Cotes.**

The Present Situation in the Persian Gulf. By E. Cotes.

Philippine Islands. **Landor.**

The Gems of the East. Sixteen Thousand Miles of Research Travel among Wild and Tame Tribes of Enchanting Islands. By A. Henry Savage Landor. 2 vols. London: Macmillan & Co., 1904. Size 9 × 6, pp. (vol. i.) xii. and 328; (vol. ii.) xii. and 460. *Map and Illustrations. Price 30s. net. Presented by the Publishers.* [To be reviewed.]

Russia—Siberia. **Kropotkin.**

Orographie de la Sibérie précédée d'une introduction et d'un Aperçu de l'Orographie de l'Asie. Par Pierre Kropotkine. (Université Nouvelle, Institut Géographique de Bruxelles, Publication No. 9.) Bruxelles, 1904. Size 10 × 6½, pp. 120. *Maps and Section.*

Translation of the monograph published in 1876 in the *Mémoires* of the Russian Geographical Society, with an introduction and summary of the present state of our knowledge of the orography of Asia, on which the author's views were put before the readers of the *Journal* in February and March.

Russia—Siberia—Alatau. *Iz. Imp. Russian G.S.* **39** (1903): 390–436. **Tolmacheff.**

Geological Excursion in the Kusnetski Alatau in the Summer of 1902. By T. P. Tolmacheff. Preliminary Report. *Maps and Illustrations.* [In Russian.]

See note in vol. xxiii. p. 785.

Russia—Siberia—"Naledi." *Iz. Imp. Russian G.S.* **39** (1903): 305–337. **Podyakonof.**

On the "Naledi" of Eastern Siberia and the causes to which they are due. By S. A. Podyakonof. *Illustrations.*

See note, *ante*, p. 224.

AFRICA.

Abyssinia—Kaffa. **Villespy.**
Missions Cath. **36** (1904): 22–23, 28–33, 45–47, 57–59, 66–72.

La Mission de Kaffa. Par le P. Séraphin de Villespy. *With Map and Illustrations.*

Abyssinia. *National G. Mag.* **15** (1904): 165–166. **Skinner.**

Consul Skinner's Mission to Abyssinia. *With Illustration.*

Africa. **Hubert.**

Lucien Hubert. Politique Africaine. Maroc, Afrique occidentale, Algérie, Tchad, l'Effort étranger. Préface de M. Eugène Étienne. Paris: Dujarric & Cie., 1904. Size 7½ × 5, pp. 302. *Price* 3.50 *fr.*

Deals chiefly with the French possessions, but contains a chapter on modern railway enterprise in Africa generally.

Bantu Race. *Deuts. Rundschau G.* **26** (1904): 145–150. **Bencke.**

Ein Beitrag zur Ethnographie Afrikas. Von Albert Bencke.

Discusses the origin of the Bantus.

British Central Africa. ———

British Central Africa Protectorate. Diary, 1904. With Official Handbook on the Protectorate compiled in the Secretariat, B.C.A.A. Zomba. Size 10 × 5, pp. 66. *Price* 3*s.* 6*d.* *Presented by H.M. Commissioner, Zomba.*

British East Africa. **Linton.**

Africa. No. 5 (1904). Agricultural Report on the District between Voi and Kiu, in the East Africa Protectorate, by Mr. A. Linton, and Return of Game shot in the Protectorate during 1903. London: Eyre & Spottiswoode, 1904. Size 13½ × 8½, pp. 12. *Price* 2*d.*

Cape Colony—Geology. ———

Cape of Good Hope. Department of Agriculture. Annual Report of the Geological Commission. Size 10½ × 6½, pp. 67. *Map. Presented by the Geological Commission.*

Cape Colony—Meteorology. *T.S. African Philos. S.* **14** (1903): 413–417. **Stewart.**

A Note on the Quantities given in Dr. Marloth's Paper "On the Moisture Deposited from the South-East Clouds." By Charles M. Stewart.

Congo—Bangala Grammar. **Stapleton.**

Suggestions for a Grammar of "Bangala" (the *Lingua Franca* of the Upper Congo), with 2000 Words and many useful Phrases. By W. H. Stapleton. Yakusu: Baptist Missionary Society, 1903. Size 7 × 5, pp. 116. *Presented by Rev. G. Grenfell.*

Congo—Languages. **Stapleton.**

Comparative Handbook of Congo Languages. Compiled and prepared for the Baptist Missionary Society, London. By W. H. Stapleton. Yakusu, 1903. Size 9 × 5½, pp. xxiv. and 326. *Presented by Rev. G. Grenfell.*

A valuable contribution to Bantu philology.

Congo—Sleeping Sickness. **Handekyn.**

Missions en Chine et au Congo **16** (1904): 41–47.

Congo. La maladie du sommeil. Lettres du P. Handekyn.

Dahome—Borgu. *A travers le Monde* **10** (1904): 101–102. **Brousseau.**

Dans le Borgou (haut Dahomey). Un Pays d'avenir. Par Georges Brousseau. *Map.*

The writer thinks Borgu adapted for European settlement.

Egypt. **Fenn.**

The Khedive's Country, the Nile Valley and its Products. Edited by G. Manville Fenn. London: Cassell & Co., 1904. Size 8½ × 6, pp. 180. *Illustrations. Presented by the Publishers.*

Deals chiefly with agricultural resources and operations in the Nile valley, on the basis of information supplied by Mr. Thomas Wright, superintendent of the Khedive's agricultural estates near Cairo, and thus of some practical value.

Egypt—Irrigation. **Barois.**

Les Irrigations en Égypte. Par Julien Barois. Paris: C. Béranger, 1904. Size 11½ × 8, pp. iv. and 386. *Maps, Plans, and Illustrations.*

The author, now French director of the Egyptian State railways, brought out a work on the same subject in 1887, but the immense recent advances in irrigation matters has necessitated the re-writing of the book. It forms a useful summary of the facts and principles of the subject in its present stage.

Eritrea. **Rossini.**

L'Esploraz. Com. **18** (1903): 241–251, 276–281, 297–303, 325–327, 340–342; **19** (1904): 5–8, 20–24, 37–42, 51–56, 72–74, 112–122.

Al Rágali. C. Conti Rossini. *With Map.*

Detailed observations on the northern part of the Danakil country and its inhabitants.

French Sahara—Tuat. *Rev. G.* **28** (1904): 108–118. ——

Le Touat. Par un officier des compagnies sahariennes. *With Map and Illustrations.*

German South-West Africa. *Deuts. Kolonialblatt* **15** (1904): 192–195, 207-221. ——

Der Herero-Aufstand in Deutsch-Südwestafrika.

German South-West Africa. **Seiner.**

Bergtouren und Steppenfahrten im Hererolande. Von Franz Seiner. Berlin: W. Süsserott, 1904. Size 9½ × 6, pp. 278. *Map and Illustrations. Price 5s. 6d.*

See review in June number.

Gold Coast. ——

The Gold Coast Civil Service List (1903), showing the Civil Establishments, Names and Designations of the Civil Servants of Government, etc. London: [E. Stanford], 1903. Size 10 × 6½, pp. 422. *Map. Price 10s. net. Presented by the Publisher.*

Gulf of Guinea. *Ann. Hydrographie* **32** (1904): 209–221. **Wendt.**

Meeresströmungen im Golf von Guinea. Von Dr. E. Wendt.

Komoro Islands. *Rev. Colon.* (1904): 515–548. **Plantier.**

La Grande-Comore; sa colonisation. Par le Dr. Nicolas du Plantier.

Lake Nyasa. *Deuts. Rundschau G.* **26** (1904): 193–198, 307–315. **Prager.**

Der Nyassasee. Von Kapitän M. Prager. *With Maps and Illustrations.*

Madagascar. ——

Guide-Annuaire de Madagascar et Dépendances. Année 1904. Tananarive, 1904. Size 9 × 6, pp. x. and 858. *Maps. Presented by General Gallieni.*

Madagascar. *La G., B.S.G. Paris* **9** (1904): 241–248. ——

Les travaux géodésiques, topographiques et cartographiques exécutés à Madagascar en 1902 et 1903. *With Map.*

Madagascar. *C. Rd.* **138** (1904): 1076–1079. **Colin.**

Travaux géodésiques et magnétiques aux environs de Tananarive. Note du P. Colin. *Diagram.*

Madagascar—Language. *J. Asiatique* **2** (1903): 451–485. **Ferrand.**

L'élément arabe et souahili en malgache ancien et moderne. Par G. Ferrand.

Morocco. *Tour du Monde* **10** (1904): 37-60. **Kann.**

A travers le Maroc révolté. Par R. Kann. *With Illustrations.*

Morocco. **Weisgerber.**

Dr. F. Weisgerber. Trois mois de campagne au Maroc. Étude géographique de la région parcourue. Paris: E. Leroux, 1904. Size 9½ × 6, pp. 240. *Maps and Illustrations. Price 5 fr. Presented by the Author.*

Nigeria. *B.S.G. Rochefort* **25** (1903): 213–234. **Figeac.**

Peuplement du Bassin du Moyen-Niger par des envahisseurs de race blanche venus du Nord-Est. Par T. Figeac.

NORTH AMERICA.

Alaska. *B. American G.S.* **36** (1904): 65–80. **Lansing.**

The Questions settled by the Award of the Alaskan Boundary Tribunal. By R. Lansing. *With Map.*

Alaska—Boundary. ——

Alaskan Boundary Tribunal. The Argument of the United States before the Tribunal convened at London under the provisions of the Treaty between the United States of America and Great Britain concluded January 24, 1903. (Pp. vi., 204, and 18).—The Case of the United States (pp. 550).—The Counter Case (pp. 290). Washington, 1903. Size 9½ × 6. *Two Atlases (separate).* Size 18 × 15. *Presented by the United States Embassy.*

Alaska—Mount McKinley. *J.G.* **2** (1903): 441–469. **Brooks.**

An Exploration to Mount McKinley, America's Highest Mountain. By Alfred H. Brooks. *Map and Illustrations.*

Account of the expedition of 1902 (cf. *Journal*, vol. xxi. p. 459).

Canada—Altitudes. **White.**

Dictionary of Altitudes in the Dominion of Canada, with a Relief Map of Canada.

By James White. Ottawa, 1903. Size 10 × 7, pp. x. and 144. *Presented by the Canadian Government.*

Mexico. **Pimentel.**

Obras completas de D. Francisco Pimentel. Publícanlas parar honra la memoria del autor sus hijos, Jacinto y Fernando. 5 vols. Mexico: Tipografia Económica, 1903–1904. Size 10½ × 7, pp. (vol. i.) cx. and 510; (vol. ii.) 614; (vol. iii.) 544; (vol. iv.) 576; (vol. v.) 516. *Portrait. Presented by the Sociedad Mexicana de Geografia y Estadistica.*

Includes many papers on the peoples and languages of Mexico, studies in political economy and on Mexican writers and literature.

North America—Early Travels. **Thwaites.**

Early Western Travels, 1748–1846. A Series of Annotated Reprints of some of the best and rarest contemporary volumes of travel, descriptive of the Aborigines and Social and Economic Conditions in the Middle and Far West, during the Period of Early American Settlement. Edited with Notes, Introductions, Index, etc., by R. G. Thwaites. Vol. i. Journals of Conrad Weiser (1748), George Croghan (1750–1765), Christian Frederick Post (1758), and Thomas Morris (1764). Cleveland, Ohio: The Arthur H. Clark Co., 1904. Size 9½ × 6½, pp. 328. *Portrait.*

This series is to be completed in thirty-one vols.

United States. ——

Annual Reports of the War Department for the Fiscal Year ended June 30, 1903. Vols. ix.–xiii. (Report of the Chief of Engineers, Parts i.–iv. and Supplement.) Washington, 1903. Size 9½ × 6, pp. 3012 (supplement 318). *Maps, Plans, and Illustrations. Presented by the Engineer Department, United States Army.*

United States—California—Hydrography. **Lippincott.**

California Hydrography. By J. B. Lippincott. (United States Geological Survey, Water-Supply and Irrigation Paper No. 81.) Washington, 1903. Size 9½ × 6, pp. 488. *Maps.*

United States—Cape Ann—Geology. **Tarr and Woodworth.**

B. Mus. Compar. Zool. **42** (*Geol. Ser.* **6**) (1903): 181–196.

Post-glacial and Interglacial (?) Changes of Level at Cape Ann, Massachusetts. By R. S. Tarr. With Note on the Elevated Beaches, by J. B. Woodworth. *Thirteen Plates.*

United States—Ethnology. **Powell.**

Twentieth Annual Report of the Bureau of American Ethnology to the Secretary of the Smithsonian Institution, 1898–99. By J. W. Powell. Washington, 1903. Size 11½ × 8, pp. cexxiv. and 238. *Plates. Presented by the Bureau of American Ethnology.*

The bulk of the report consists of a monograph on aboriginal pottery in the Eastern United States.

United States—Hydrology. **Rafter.**

The relation of Rainfall to Run-off. By G. W. Rafter. (United States Geological Survey Water-Supply and Irrigation Paper No. 80.) Washington, 1903. Size 9½ × 6, pp. 104. *Diagrams.*

United States—Illinois. *B. American G.S.* **36** (1904): 145–157. **Hubbard.**

A Case of Geographic Influence upon Human Affairs. By G. D. Hubbard. *With Maps.*

Discusses the influence of past glaciation on the life (vegetable, animal, and especially human) of Wisconsin.

United States—Maryland. *American Science* **17** (1904): 141–159. **Mathews.**

The Structure of the Piedmont Plateau as shown in Maryland. By Edward Bennett Mathews. *Map.*

United States—Meteorology. *Monthly Weather Rev.* **31** (1904): 625–652. ——

Annual Summary, 1903. Report of the Chief of the Weather Bureau for the fiscal year ending June 30, 1903. *With Charts.*

United States—Mississippi. *J. Franklin I.* **157** (1904): 381–389. **Meerten and Haupt.**

Controlling the Floods of the Mississippi. By H. van Meerten and L. M. Haupt.

United States—New York. *American J. Sci.* **17** (1904): 333–346. **Tuttle.**

Recent Changes in the Elevation of Land and Sea in the Vicinity of New York City. By G. W. Tuttle. *With Diagram.*

United States—Petroleum. **Montague.**

The Rise and Progress of the Standard Oil Company. By G. H. Montague. New York and London: Harper & Bros., 1904. Size 8 × 5, pp. vi. and 144. *Price* $1.00 *net. Presented by the Publishers.*

CENTRAL AND SOUTH AMERICA.

Bolivia—Chuquisaca. ——

Sociedad Geográfica Sucre. Diccionario geográfico del Departamento de Chuquisaca. Contiene datos geográficos, históricos y estadisticos. Sucre, 1903. Size 9 × 6½, pp. xiv. and 372. *Presented by the Oficina Nacional de Immigracion, etc., La Paz.*

Brazil. *Meteorolog. Z.* **21** (1904): 169–175. **Draenert.**

Das Klima von Blumenau im Staate Santa Catharina, Brasilien. Von Prof. F. M. Draenert.

Brazil—Cartography. *Science* **19** (1904): 681–694. **Derby.**

The North-East Coast of Brazil in Ancient Cartography. By Dr. O. A. Derby. *With Maps.*

Noticed in the Monthly Record, *ante*, p. 227.

Brazil—Historical. **Edmundson.**

The Dutch on the Amazon and Negro in the Seventeenth Century. By George Edmundson. (Reprinted from the *English Historical Review*, October, 1903.) Size 10 × 6, pp. 22. [See p. 227.]

Brazil—Purus. *Annual Rep. Smithsonian I.* (1901): 359–393. **Steere.**

Narrative of a Visit to Indian Tribes of the Purus River, Brazil. By Joseph Beal Steere. *Plates.*

Brazil and Bolivia—Acre. **Deheza.**

La Cuestión del Acre. Por José A. Deheza. Sucre, 1903. Size 7½ × 4½, pp. 108. *Map.*

Costa Rica—Antiquities. *Globus* **85** (1904): 233–239. **Seler.**

Archæologische Untersuchungen in Costarica. Von Dr. Ed. Seler. *Illustrations.*

Ecuador. *C. Rd.* **138** (1904): 1013–1019. **Poincaré.**

Rapport présenté au nom de la Commission chargée du contrôle scientifique des opérations géodésiques de l'Équateur. Par H. Poincaré.

Noticed in the Monthly Record for July (p. 98).

Ecuador—Andes. *Globus* **85** (1904): 149–157. **Meyer.**

Die Gegenwärtigen Schnee- und Eisverhältnisse in den Anden von Ecuador. Von Prof. Hans Meyer. *Illustrations.*

Honduras. *B.S.R.G. d'Anvers* **28** (1904): 39–84. **Jalhay.**

Notice sur les mines d'or et d'argent de la République de Honduras. Par H. Jalhay.

Mexico—Popocatepetl. *A travers le Monde* **10** (1904): 9–11, 29–30. **Laroussie.**

Une Ascension du Popocatepetl. Par J. C. Laroussie. *With Illustrations.*

Panama. *Deuts. Rundschau G.* **26** (1904): 177–179. —

Die Republik Panama. *Map.*

Panama. *Nat. G. Mag.* **15** (1904): 57–73. **Burr.**

The Republic of Panama. By W. H. Burr. *Illustrations.*

Panama Canal. *National G. Mag.* **15** (1904): 167–176. **Page.**

The Sailing Ship and the Panama Canal. By James Page. *With Diagrams.*

Peru. **Torres.**

El Istmo de Fitz-Carrald. Informe presentado á la Junta de Vias Fluviales por el Ingeniero Juan M. Torres. Lima, 1903. Size 8½ × 6½, pp. x. and 404.

This report appeared in the publication of the Junta de Vias Fluviales, lately noticed in the *Journal* (vol. xxiii. p. 604).

Peru—Huayabamba. *B.S.G. Lima* **13** (1903): 295–309. **Calderon.**

La via fluvial del Huayabamba. Por Germán Torres Calderón. *Map.*

St. Vincent and Martinique. **Anderson and Flett.**

Report on the Eruptions of the Soufrière, in St. Vincent, in 1902, and on a Visit

to Montagne Pelée, in Martinique. Part i. By Dr. Tempest Anderson and Dr. J. S. Flett. (*Philosophical Transactions of the Royal Society of London*, Series A, vol. 200, pp. 353–553.) London: Dulau & Co., 1903. Size 12 × 9. *Map and Plates. Price* 15*s.* 6*d.*

Salvador. **Guzmán.**

An. Museo Nac. San Salvador **1** (1903): 22–27, 103–107, 161–165, 184–195.

Geologia de El Salvador. D. J. Guzmán.

South America—Aimará Language. **Escobari.**

Silabario Aimará. Con la Ortologia propria de esta lengua y del Quichua. Por Macario D. Escobari. La Paz, 1903. Size 7½ × 4½, pp. 38.

West Indies—Bahamas. ———

General Descriptive Report on Bahamas Islands, including Annual Report for 1902. Size 13 × 8½, pp. 61. *Map and Illustrations. Price* 1*s.* 2*d.*

AUSTRALASIA AND PACIFIC ISLANDS.

New Guinea—Dutch. **Dissel.**

Tijds. K. Ned. Aardr. Genoots. Amsterdam **21** (1904): 478–517.

Landreis van Fakfak naar Sekar. Door J. S. A. van Dissel. *With Map.*

Journey in the peninsula to the south of McCluer gulf.

New Guinea—Dutch. *Tijds. K. Nederl. Aardr. Genoots.* **21** (1904): 339–355. **Ijzerman.**

Mededeelingen omtrent eene Ontworpen Expeditie naar de Binnenlanden van Nieuw-Guinea. Door J. W. Ijzerman. *Map.*

Discusses the aims and methods of an expedition which is being organized for the exploration of the great mountain range of the interior of Dutch New Guinea, proof of the occasional presence of snow on which has lately been obtained. The map shows the results of a recent survey of part of the south coast.

New Guinea—Dutch. **Niermeyer.**

Tijds. K. Nederl. Aardr. Genoots. **21** (1904): 355–364.

Over de Expeditie Wichmann in Nieuw-Guinea. Door J. F. Niermeyer.

Cf. note in *Journal* for January, 1904, p. 130.

New South Wales. **Coghlan.**

Picturesque New South Wales. An Illustrated Guide for Settler and Tourist. T. A. Coghlan. [Sydney, 1903.] Size 10 × 7½, pp. viii. and 210. *Maps and Illustrations. Presented by the Agent-General for New South Wales.*

POLAR REGIONS.

Antarctic—Meteorology. **Arçtowski.**

Aperçu des résultats météorologiques de l'hivernage Antarctique de la *Belgica*. Par H. Arçtowski. Bruxelles, 1904. Size 7½ × 5, pp. 42. *Diagram.*

Antarctic—Swedish Expedition. **Nordenskjöld, Andersson, and Larsen.**

Ymer **24** (1904): 43–86.

Den svenska sydpolar expeditionen 1901–03.—I. Allmän öfversikt samt redogörelse för vinterstationen vid Snow Hill. Af Otto Nordenskjöld. *With Map and Illustrations.* II. De vetenskapliga arbetena ombord på Antarctic sommaren 1902–1903 och slädfärden till Snow Hill 1903. Af J. G. Andersson. *With Illustrations.* III. Antarctics sidste færd. Af C. A. Larsen. *With Illustrations.*

Arctic—Hydrography. *Iz. Imp. Russian G.S.* **39** (1903): 338–361. **Varnek.**

Review of the work of the Arctic Hydrographic Expedition in 1902. By A. T. Varnek. *Maps.* [In Russian.]

Arctic—Spitzbergen. *S.G. Italiana* **5** (1904): 232–235. ———

Ascensione della vetta "Savoia" nelle Spitzberghe. Por Lorenzo Bertolin. *Illustrations.*

MATHEMATICAL GEOGRAPHY.

Cartography—Map Collection. **James.**

Tijds. K. Nederl. Aardr. Genoots. **21** (1904): 368–373.

Museum Geographicum Bodellianum. Door O. G. James.

On the Bodel collection of maps at Leyden.

Geodesy. **Bakhuyzen.**

Comptes rendus des séances de la Quartorzième Conférence Générale de l'Association Géodésique Internationale réunie à Copenhague du 4 au 13 Août 1903. Rédigés par le Secrétaire perpétuel H. G. Van de Sande Bakhuyzen. 1er volume: Procès-verbaux et rapports des Délégués sur les travaux géodésiques accomplis dans leurs pays. Berlin: G. Reimer, 1904. Size 12 × 9½, pp. 258. *Maps.*

Longitude Determination. *C. Rd.* **138** (1904): 1027–1030. **Ditisheim.**

Essai d'une détermination de différence de longitude par transport de l'heure. Note de P. Ditisheim.

Nautical Almanac. ——

The Nautical Almanac and Astronomical Ephemeris for the year 1907. Edinburgh, 1904. Size 9½ × 6, pp. 605 and 45. (Also Part i. separately.)

Position Determination. *B. American G.S.* **36** (1904): 138–142. **Littlehales.**

Concerning Sextant Observations for determining Geographical positions. By G. W. Littlehales.

Shape of the Earth. *J.G.* **2** (1903): 481–486, 521–527. **Moulton.**

The Shape of the Earth. By Forest R. Moulton.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Climate and Life. *B. American G.S.* **36** (1904): 142–145. **Wieland.**

Polar Climate in time the Major Factor in the Evolution of Plants and Animals. Abstract of a paper by G. R. Wieland.

Hydrology. *C. Rd.* **138** (1904): 1030–1032. **Maillet.**

Sur les décrues des rivières. Note de E. Maillet.

Limnology—Seiches. **Halbfass.**

Stehende Seespiegelschwankungen (Seiches) im Madüsee in Pommern. Von Wilhelm Halbfass.

Meteorology. *B. American G.S.* **36** (1904): 129–138. **Ward.**

"Sensible Temperatures." By R. De C. Ward.

Meteorology. *Quarterly J.R. Meteorolog. S.* **30** (1904): 105–122. **Wilson-Barker.**

The Present Position of Ocean Meteorology. By Commander D. Wilson-Barker. *With Charts.*

Contains a full bibliography of the subject from 1886 to 1903.

Meteorology—Air-currents. *Monthly Weather Rev.* **32** (1904): 15–20. **Bigelow.**

Studies on the Circulation of the Atmospheres of the Sun and of the Earth. By Prof. F. H. Bigelow. III. The Problem of the General Circulation of the Atmosphere of the Earth.

Meteorology—Lake winds. *Globus* **85** (1904): 246–247. **Krebs.**

Boraartige Fallwinde an Gebirgsseen. Von Wilhelm Krebs. *Illustration.*

Meteorology—Mountain winds. **Hann.**

Sitzb. Kais. A.W., Mathem.-Naturw. Classe **111** (1902): 1615–1711.

Ueber die tägliche Drehung der Mittleren Windrichtung u. ueber eine Oscillation der Luftmassen von halbtägiger Periode auf Berggipfeln von 2 bis 4 km. Seehöhe. Von J. Hann. Textfiguren.

Natural Features. *Z. Ges. Erdk. Berlin* (1904): 194–203. **Conwentz.**

Schutz der natürlichen Landschaft, ihrer Pflanzen- und Tierwelt. Von Prof. Dr. Conwentz.

Oceanography. *Ymer* **24** (1904): 94–112. **Pettersson.**

Den internationella utforskningen af de nordiska hafven. Af A. Pettersson.

Oceanography—Gascony—Coasts. *B.G. Histor. et Descrip.* (1903): 218–227. **Saint-Jours.**

Preuves de l'Antique Stabilité des Côtes de Gascogne. Par M. Saint-Jours.

Oceanography—Methods. **Knudsen.**

Conseil Internat. Explor. Mer, Publ. de Circonstance, No. **4-5** (1903): pp. 13.

Martin Knudsen. 4, Ueber den Gebrauch von Stickstoffbestimmungen in der Hydrographie. 5, Gefrierpunkttabelle für Meerwasser.

Oceanography—Tides. *Science* **19** (1904): 704–707. **Harris.**
On the feasibility of measuring tides and currents at sea. By R. A. Harris.

Physical Geography. **Spindler.**
Lectures on Physical Geography. Parts i. and ii. By Major-General J. B. von Spindler. Size 10 × 6, pp. 633. St. Petersburg, 1903. *Maps, Diagrams, and Illustrations.* [In Russian.]

Phyto-Geography. **Warming.**
Lehrbuch der ökologischen Pflanzengeographie. Eine Einführung in die Kenntnis der Pflanzenvereine. Von Dr. E. Warming. Zweite Auflage der deutschen Ausgabe übersetzt von Dr. Emil Knoblauch, bearbeitet und nach der neuesten Litteratur vervollständigt von Paul Graebner. Berlin: Gebrüder Borntraeger, 1902. Size 10 × 6½, pp. viii. and 442. *Price 7m.*

Rivers. *P.I. Civil Engineers* **154** (1903): 292–322. **Rhind.**
Empirical Formulas for finding the Maximum Discharges of Rivers. By Robert Hunter Rhind.

Sea-beaches. *P.I. Civil Engineers* **154** (1903): 46–49. **Douglass.**
Foreshore Protection and Travel of Beaches. By William Tregarthen Douglass.

Structural Geology. **Daly.**
American J. Sci. **15** (1903): 269–298; **16** (1903): 107–126.
The Mechanics of Igneous Intrusion. By R. A. Daly.

Tides. *Ann. Hydrographie* **32** (1904): 204–208. **Wegemann.**
Einfluss des Windes und Luftdrucks auf die Gezeiten. Von G. Wegemann.

Volcanoes. *Amer J. Science* **17** (1904): 253–268. **Russell.**
Criteria relating to massive-solid Volcanic Eruptions. By Israel C. Russell. *Illustrations.*

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography. **Demolins.**
Les grandes Routes des Peuples. Essai de Géographie sociale. Comment la route crée le type social. Par E. Demolins. Les routes de l'antiquité. Paris: Firmin-Didot et Cie, [*not dated*]. Size 7½ × 5, pp. xii. and 462. *Maps. Price* 3.50 *fr.*
The second part of this study has already been entered (vol. xxiii. p. 413).

Commercial—Cotton. **Dunstan.**
British Cotton Cultivation. Report to the Board of Trade on Cotton Cultivation in the British Empire and in Egypt. By Prof. W. Dunstan, F.R.S. London: Eyre & Spottiswoode, 1904. Size 13½ × 8½, pp. iv. and 40. *Map and Diagrams. Price* 1*s.*

Commercial—Gold. *B.S. Langued. G.* **26** (1903): 417–427; **27** (1904): 27–39. **Justice.**
L'Or: sa production, sa géographie, son rôle. Par Octave Justice.

Commercial—Petroleum. *B. Union G. Nord France* **26** (1903): 200–206. ———
La Géographie générale du Pétrole.

Ethnology—American Race. **Keane.**
Cultura de los Nativos Americanos: Su Evolución independiente. Par A. H. Keane. (From 'Anales del Museo Nacional, Segunda Epocha,' Tomo i.) Size 11½ × 8, pp. 51. *Presented by the Author.*

Historical—Chinese Travellers. **Chavanney.**
Les Voyageurs Chinois. Par Éd. Chavannes. Extrait des *Guides Madrolle:* Chine du Sud: Paris, Comité de l'Asie Française, 1904. Size 7½ × 5, pp. 24. *Map. Presented by the Author.*

Historical—Columbus. **Thacher.**
Christopher Columbus, his Life, his Work, his Remains, as revealed by original Printed and Manuscript Records, together with an Essay on Peter Martyr of Anghera and Bartolomé de las Casas, the First Historians of America. By J. B. Thacher. Vol. iii. New York: G. P. Putnam's Sons, 1904. Size 11½ × 8½, pp. viii. and 776. *Illustrations. Price* 36*s.*

Historical—Columbus and Toscanelli. **Altolaguirre.**
Cristóbal Colón y Pablo del Pozzo Toscanelli. Estudio crítico del proyecto, formulado por Toscanelli y seguido por Colón, para arribar al extremo Oriente de

Asia navegando la via del Oeste. Par Angel de Altolaguirre y Duvale. Madrid, 1903. Size 11 × 8, pp. x. and 430. *Price* 15*s*.

Historical—Ferdinand Columbus. *B.R.S.G. Madrid* **46** (1904): 103–145. **Blazquez.**

El Itinerario de D. Fernando Colón y las Relaciones topográficas. Par D. A. Blazquez.

BIOGRAPHY.

Claudius Clavus. *Globus* **85** (1904): 245–246. ——

C. C. Swart, der Erste Kartograph des Nordens.

The Danish geographer Claudius Clausen Swart, better known as Claudius Clavus, was born in 1388.

Delegorgue. *B.S.G. Lille* **41** (1904): 276–278. ——

Le Tueur d'Éléphants.

Adulphe Delegorgue travelled extensively in South Africa early in the nineteenth century. It is proposed to erect a monument in his honour.

Hein. *Deuts. Rundschau* **26** (1904): 182–184. **Sieger.**

Dr. Wilhelm Hein. Von Sieger. *Portrait.*

This explorer of Southern Arabia died on November 19 last.

Herder. *Deutsch. Rundschau G.* **26** (1904): 327–329. ——

Johann Gottfried Herder. *With Portrait.*

Herder, the centenary of whose death was lately celebrated, is described as the most important forerunner of Ritter in the field of comparative geography.

Makaroff. *Ann. Hydrographie* **32** (1904): 193–195. **Schott.**

S. O. Makaroff. Von Dr. G. Schott.

GENERAL.

British Empire—Economic resources. **Dunstan.**

Imperial Institute of the United Kingdom, the Colonies, and India. Technical Reports and Scientific Papers. Edited by W. R. Dunstan. With a Preface by the late Sir F. Abel, Bart. London, 1903. Size 8½ × 5½, pp. xlviii. 378 and 236. *Map. Presented by the Imperial Institute.*

Includes a number of valuable reports on economic products of parts of the British Empire.

Educational. ——

Descriptive Catalogue (Illustrated) of Stereographs designed for use in Classes and Libraries of Public and Private Schools. Compiled by W. E. Long. New York and London, 1902. Size 9½ × 6, pp. 119.

Educational. **Cornwell.**

A School Geography. By James Cornwell. Ninetieth Edition. With numerous Revisions and Additions by Ben Jonson. Edited by J. Cornwell Round. London: Simpkin & Co., 1904. Size 7½ × 5, pp. 384. *Maps and Illustrations. Presented by the Editor.*

The attempt to bring this book into line with modern conceptions of geography has met with very partial success.

Weights and Measures. **Horta y Pardo.**

Tratado de Metrologia Universal Novisima: Medidas y pesas de todos los pueblos de la Tierra. Por el Dr. C. del Horta y Pardo. Tercera edición. Barcelona, 1904. Size 9 × 6½, pp. xii. and 228. *Plate. Presented by the Author.*

A useful work, giving the systems of weights and measures in use among all nations, and the bases of comparison between them. Some old measures are also given.

Year-book. **Haack.**

Geographen-Kalender . . . herausgegeben von Dr. H. Haack. Zweiter Jahrgang 1904–1905. Gotha: J. Perthes, 1904. Size 6½ × 4, pp. xii., 206, and 290. *Portrait and Maps.*

A considerable number of new features have been introduced into the second issue of this useful book, and improvements have been made here and there in the parts remaining the same as in the first. The two issues require to be kept together for purposes of reference, for, in order to avoid unduly swelling the bulk, certain of the data in the former volume have been omitted. The new features include tables of the Earth's dimensions in Russian measures, lists of the geographical societies, institutions, and periodicals of the world, the postal and other tariffs of the various countries, and so on. The portrait given as frontispiece is of Sir Clements Markham.

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

Bulgaria. **Military Topographical Dept., St. Petersburg.**

Russian Staff Map of Bulgaria. Scale 1:126,000 or 1·9 stat. mile to an inch. Sheets: vi.-2, Tirn-Radomir; vi.-3, Sofia-Orkhanie; vii.-2, Kostendil; vii.-3, Ikhtiman-Samakov. St. Petersburg: Military Topographical Department, 1903.

England and Wales. **Ordnance Survey.**

ORDNANCE SURVEY OF ENGLAND AND WALES:—Sheets published by the Director-General of the Ordnance Survey, Southampton, from June 1 to 30, 1904.

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(Third edition) in outline, 285, 343, 1*s. each* (engraved).
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ASIA.

China. **Königl. Preuss. Landes-Aufnahme.**

Karte von Ost-China. Scale 1:1,000,000 or 15·8 stat. miles to an inch. Sheets: Kirin, Pyŏng-yang, Söul, Wladiwostok. Kartographische Abtheilung der Königl. Preuss. Landes-Aufnahme, 1904. 1.50*m. each sheet.*

Eastern Asia. **Imperial Topographical Institute, St. Petersburg.**

Map of Eastern Asia. Scale 1 : 4,000,000 or 63 stat. miles to an inch. 3 sheets. St. Petersburg: Imperial Topographical Institute, 1904. [In Russian.]

Eastern Asia. **Peucker.**

Uebersichtskarte von Ost-Asien. Scale 1 : 5,000,000 or 69 stat. miles to an inch. Entworfen und bearbeitet von Dr. Karl Peucker. Vienna: Artaria & Co., 1904. *Price* 1.40*m.* *Presented by the Publisher.*

Japan. **Japanese Imperial Geological Survey.**

Topographical Map of Japan. Scale 1 : 200,000 or 3·1 stat. miles to an inch. Sheets: Kinomoto and Nachi. Tokyo: Imperial Geological Survey, 1903. *Presented by the Imperial Geological Survey of Japan.*

Topographical and Geological Maps of the Japanese Empire. Scale 1 : 1,000,000 or 15·8 stat. miles to an inch. Compiled by the Imperial Geological Survey of Japan. 15 sheets each. Tokyo, 1902. *Presented by the Imperial Geological Survey of Japan.*

These two maps are good specimens of the excellent cartographical work now produced in Japan. The first is a general topographical map of the Japanese Empire, carefully reduced from large survey sheets, and showing relief by horizontal lines in brown, which are extremely clear and well drawn. It is not overcrowded with names, and altogether may be considered very satisfactory. In the north-west corner there is an inset map of Japan on the scale of 1 : 5,000,000, showing heights and depths by colour tinting.

The second map shows the geological features by a carefully selected series of tints, with a clear explanation, and contains, as an inset, an interesting map of Japan, on the scale of 1 : 5,000,000, showing the distribution of volcanoes. Each volcano has a number on the map, and by reference to an adjacent list the name can be readily found. The Imperial Geological Survey of Japan has been doing good work for years past, but as many of their sheets are on too large a scale for general reference, the Department has done excellent service to geologists and geographers generally by publishing these two maps. They will be all the more useful as the lettering is in English.

Manchuria. **Königl. Preuss. Landes-Aufnahme.**

Karte des russischen Schutzgebietes auf der Halbinsel Liau-tung. Scale 1 : 200,000 at 3·1 stat. miles to an inch. Herausgegeben von der Kartographische Abtheilung der Königl. Preuss. Landes-Aufnahme, 1904. *Price* 1*m.*

Shantung. **Anz.**

Walter Anz' Reisen in Schantung, 1902–1903. Scale 1 : 1,000,000 or 15·8 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1904, Tafel 8. Gotha: Justus Perthes, 1904. *Presented by the Publisher.*

AFRICA.

Africa. **Intelligence Division, War Office.**

Africa. Scale 1 : 1,000,000 or 15·8 stat. miles to an inch. Sheets: 4 (Provisional issue, without hills), North-East Morocco; 11 (Provisional issue, without hills), South-East Morocco; 83, Ngoko. *Price 2s. each sheet.* Scale 1 : 250,000 or 3·9 stat. miles to an inch. Sheets; Northern Nigeria (Provisional) 61—C, D, G, H, K, L, O, P. *Price 1s. 6d. each sheet.* London: Intelligence Division, War Office, 1904. *Presented by the Director of Military Operations.*

Morocco. **Roquevaire.**

Carte de Maroc, dressée et dessinée par R. de Flotte de Roquevaire. Scale 1 : 1,000,000 or 15·8 stat. miles to an inch. 4 sheets. Paris: Henry Barrère, 1904.

So many alterations and additions have been made to this well-known map of Morocco, that it would be more correct to consider the present issue as an entirely new map rather than a revised edition of an earlier one. It has, in fact, been redrawn, and is now in four sheets instead of two as before. The hill work is printed in a darker colour. Routes are shown in red, and water blue. In addition to the principal map, there are seventeen inset plans of towns.

AMERICA.

Canada. **Surveyor-General's Office, Ottawa.**

Sectional Map of Canada. Scale 1 : 190,080 or 3 stat. miles to an inch. Moose Mountain sheet (34), West of Second Meridian, revised to April 12, 1904; Swift

Current sheet (50), West of Third Meridian, revised to May 2, 1904; St. Ann sheet (87), West of Fifth Meridian, revised to May 19, 1904. Ottawa: Surveyor-General's Office, 1904. *Presented by the Surveyor-General of Canada.*

Patagonia. **Steffen.**

Tiefenkarte des Baker Fjords (Westpatagonien). Nach den Aufnahmen und Lotungen des chilenischen Kanonenboots "Magallanes" 1900, entworfen von Dr. Hans Steffen. *Petermanns Geographische Mitteilungen*, Jahrgang 1904. Tafel 9. Gotha: Justus Perthes, 1904. *Presented by the Publisher.*

AUSTRALIA.

Queensland. **Cameron.**

Sketch-map of the Walsh and Tinaroo Mineral Field. Prepared at the Geological Survey Office from the latest surveys of the Lands, Railways, and Mines Departments, under the supervision of Walter E. Cameron, B.A., Assistant Government Geologist. Scale 1:126,720 or 2 stat. miles to an inch. 2 sheets. Brisbane: Geological Survey Office, 1904. *Presented by the Queensland Geological Survey.*

GENERAL.

World. **Hartleben.**

A. Hartleben's Volks-Atlas enthaltend 72 Karten in Einhundert Kartenseiten. Vierte-Auflage. 1 Lieferung. Vienna and Leipzig: A. Hartleben, [1904]. *Price 50pf.*

This is the first part of the fourth edition of this cheap popular atlas. When complete it will consist altogether of twenty parts, containing seventy-two maps and one hundred inset plans with a full index. The maps are in colours, and printed only on one side of the paper. The price for the complete atlas is to be ten marks. This first part contains the following maps: No. 48, Servia, Bulgaria, and Macedonia; 93, South America (north part); 71, Persia, Afghanistan, and Baluchistan; 12, Atlantic Ocean, showing telegraph cables and tracks of steamers.

World. **Petrie and Schokalsky.**

Marcks' Large General Table Atlas. Edited by Prof. E. J. Petrie and Colonel J. de Schokalsky. Part 6. St. Petersburg: A. F. Marcks, 1904. [In Russian.] *Presented by the Publisher.*

This part contains sheets 11^{bis} and 12^{bis} of a general map of European Russia on the scale of 1:2,000,000; maps of Denmark and Scandinavia on the scale of 1:1,500,000, Italy on the scale of 1:2,750,000, and Australia and Polynesia on the scale of 1:27,000,000.

World. **St. Martin and Schrader.**

Atlas Universel de Géographie. Commencé par M. Vivien de St. Martin et continué par Fr. Schrader. Sheet No. 72, États-Unis. Paris: Librairie Hachette et Cie. *Price 2fr. Presented by the Publisher.*

World. **Sohr-Berghaus.**

Neue zeitgemässe Bearbeitung von Sohr-Berghaus Hand-Atlas über alle Teile der Erde. Entworfen und unter Mitwirkung von Otto Herkt herausgegeben von Prof. Dr. Alois Bludau. Früher herausgegeben von F. Handtke. Neunte Auflage. Lieferung 8. Glogau: Carl Flemming. *Price 1m.*

This part contains the following maps: France, sheet 3, scale 1:1,500,000; Spain and Portugal, scale 1:3,000,000; South America, sheet 2, scale 1:10,000,000.

CHARTS.

North Atlantic and Mediterranean. **Meteorological Office.**

Pilot Chart of the North Atlantic and Mediterranean for July, 1904. London: Meteorological Office. *Price 6d. Presented by the Meteorological Office, London.*

United States Charts. **United States Hydrographic Office.**

Pilot Chart of the North Atlantic Ocean for June, and of the North Pacific Ocean for July, 1904. U.S. Hydrographic Office, Washington, D.C., 1904. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

British Columbia. **Troup.**

Twenty-five photographs taken in Cassiar, British Columbia, by Montague Troup, Esq. *Presented by Frederick V. Longstaff, Esq.*

These excellent photographs form a welcome addition to the Society's collection, as the Cassiar district of British Columbia is still sufficiently remote to be out of the beaten paths of the ordinary traveller and photographer. The following is a list of the titles:—

(1 and 2) Panorama of Dease flat; (3) Panorama of Thibert Creek mine; (4) Monitor working, Thibert Creek; (5, 20, and 21) Two monitors working, Thibert Creek; (6) Thibert Creek, looking down creek to Dease Lake; (7) Removing boulders, Thibert Creek; (8) Home-made boat, Stickine River; (9) Mining camp, Thibert Creek; (10 and 11) Thibert Creek, 6-inch monitor; (12) Hudson Bay wharf, Dease Lake; (13) Thibert Creek; (14) Dease Creek; (15) Mouth of Dease Creek, Dease Lake; (16) Thibert Creek mine, showing flume; (17) Thibert Creek mine, showing workings; (18) Thibert Creek mine, man working monitor; (19) Dease River flat and lake; (22 and 24) Interior of mine, Thibert Creek; (23) Tal-tan Indians, Stickine River; (25) Hudson Bay store at Glenora, Stickine River.

Tibet. **Norzunoff and Tsybikoff.**

Fifty photographs of Lhasa and other places of interest in Central Tibet, taken in 1900 and 1901, on behalf of the Imperial Russian Geographical Society, by MM. O. Norzunoff and G. Tsybikoff. *Presented by the Imperial Russian Geographical Society.*

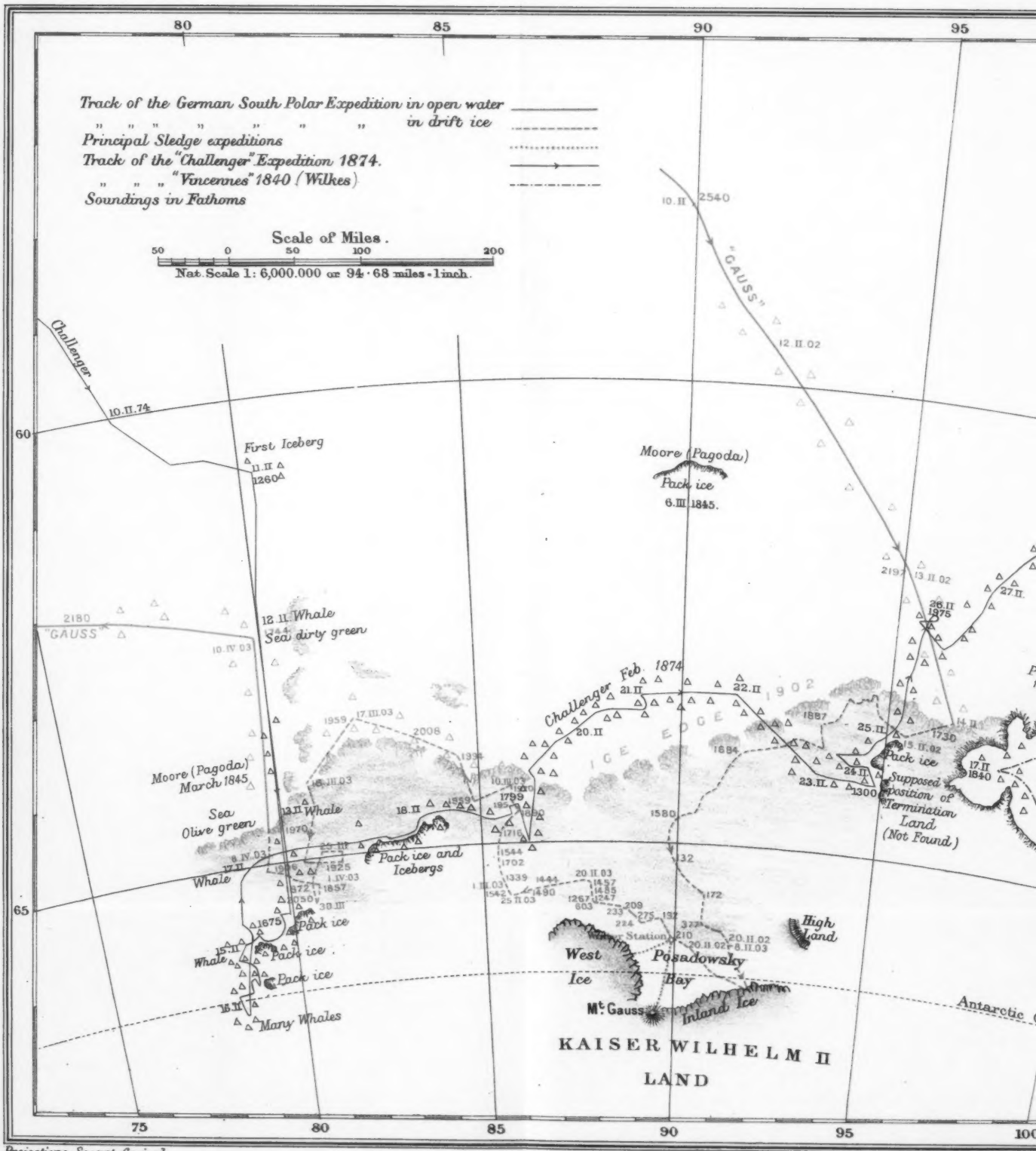
Through the courtesy of the Imperial Russian Geographical Society, the Society has been presented with this most interesting set of photographs of Lhasa, which were referred to by the President in his recent annual address, and in a note in the *Geographical Journal* for January last, whilst a selection of them was shown as lantern slides at the last meeting of the Society. A carefully written description of the photographs has been furnished by M. Grigorieff, which adds considerably to their interest.

(1) Lhasa from the east; (2) Lhasa from the north; (3) Marpo-ri with the Potala from the south-south-east; (4) Marpo-ri with the Potala from the west; (5) Potala from the south; (6) Potala from the south-south-west; (7) Potala from the east; (8) Potala from the north-north-east; (9) Potala from the west-north-west; (10) A Lhasa street during the Tsog Chod; (11) Tan-gye-ling from the south-east; (12) Gah-ldan Kansar; (13) Yutog-zampa; (14) Bar-chorten; (15) Chagpo-ri from the south-east; (16) Chagpo-ri from the north-west; (17) Kundeling from the south-east; (18) Norbulinga from the east; (19) The Amban's yamen from the south-east; (20) Chja-shi-tan; (21) General view of Sera monastery from the south; (22) The principal shrines of Sera monastery viewed from the east; (23 and 24) Purba-Chog monastery from the south-east; (25) Gechen-ritod; (26) Slab of stone on which the corpses of the dead are cut to pieces at Pabon-ka-ritod; (27) De-pung monastery; (28) De-pung monastery from the east; (29) Na-chun; (30) An obo; (31 and 32) Ki-chu river; (33) Ruins of Donkar-Jong castle; (34) Yamdok Tso or Palti Lake from Kamba La; (35 and 36) Yangtse Jong; (37) Tashi-lhumpo monastery from the south; (38) Tashi-lhumpo monastery; (39) Yarba-ritod; (40) Ruins of the De-chen Jong castle; (41) Gah-ldan monastery; (42) Monument erected by the present Dalai Lama near Gah-ldan monastery; (43) Sam-yas monastery from the south; (44 and 45) Sam-yas monastery; (46) Chetan from the west; (47) Tibetan woman near the Chag La; (48) Tibetan women of the lower class; (49) Tibetan women of the better class in Sunday array; (50) Domesticated yaks on pasture.

Vegetation Types. **Karsten and Schenck.**

Vegetationsbilder, herausgegeben von Dr. G. Karsten und Dr. H. Schenck. Hefts: 6, Monokotylenbäume, von Dr. G. Karsten; 7, Strandvegetation Brasiliens, von Dr. H. Schenck; 8, Merikanische Kakteen-, Agaven- und Bromeliaceen-Vegetation, von Prof. Dr. G. Karsten und Prof. Dr. E. Stahl. Zweite Reihe, Heft 1, Epiphyten des Amazonasgebietes, von E. Ule. Jena: Gustav Fischer, 1903–1904. *Price 4m. each part.*

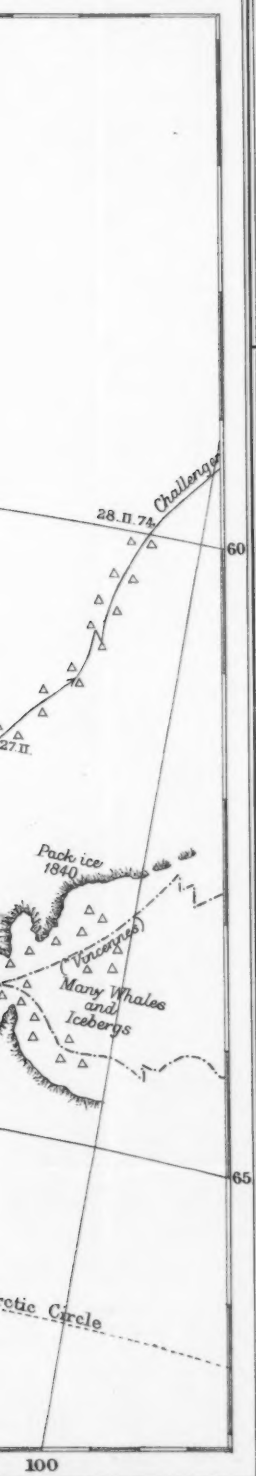
N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

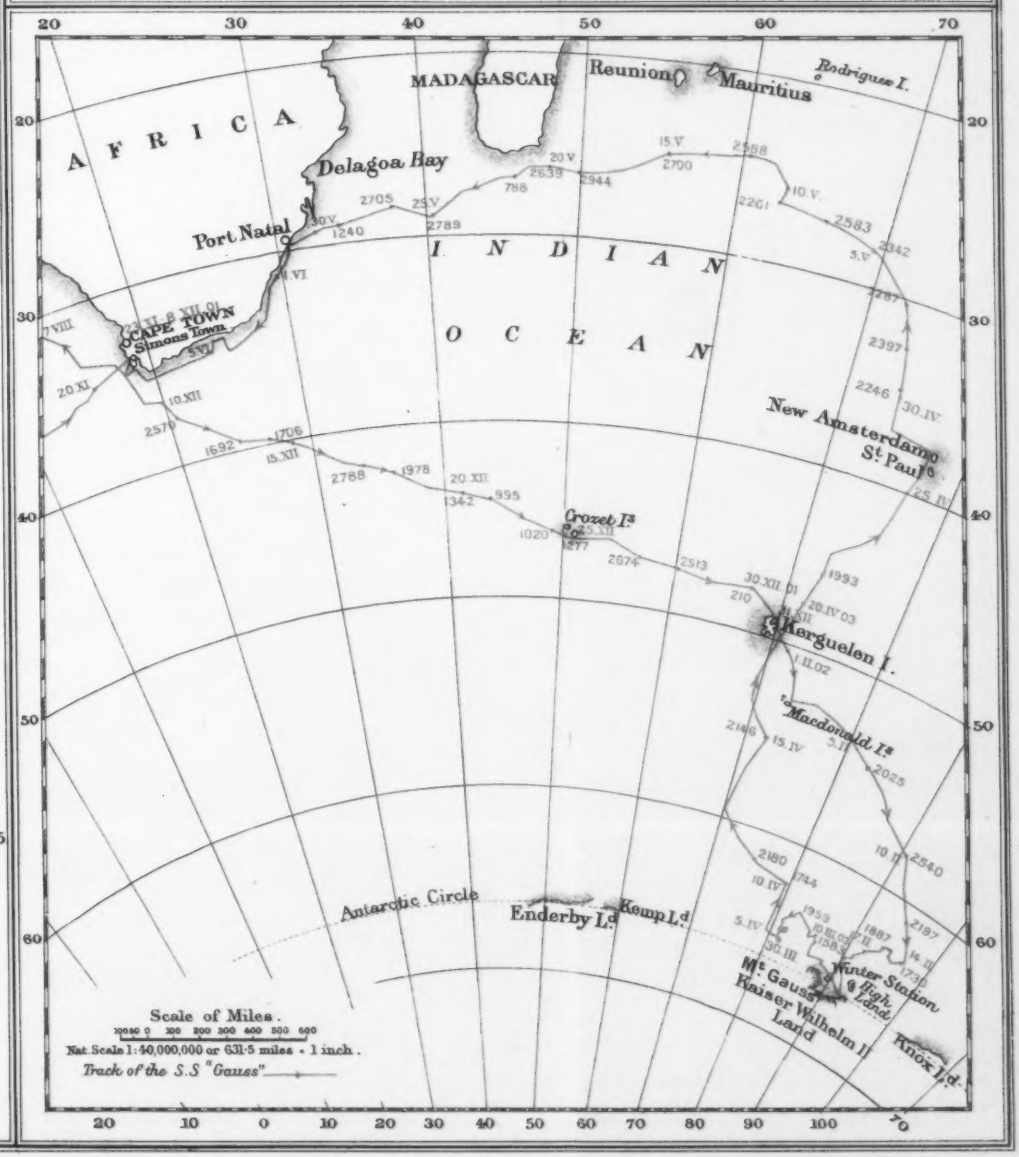


Projections, Secant Conical.

Published by the Royal Geograp

SKETCH MAPS
showing the Track & Explorations
OF THE
GERMAN SOUTH POLAR EXPEDITION.
1902–3.
BY Dr VON DRYGALSKI.



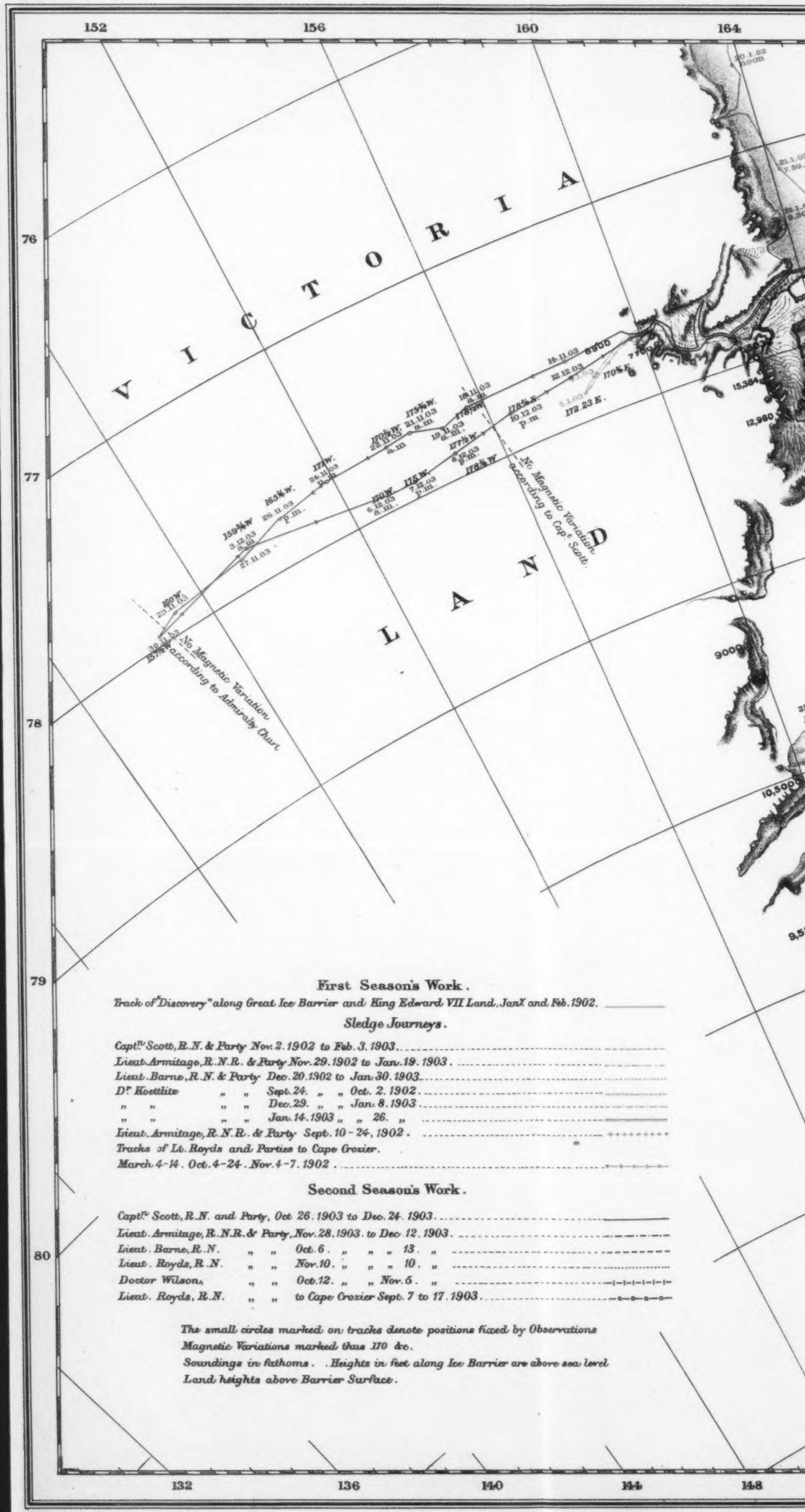


Geographical Society.

Sketch Map to illustrate
JOURNEYS IN ANGOLA
by
Capt. Boyd A. Cuninghame.
1903.
Scale of Miles.
20 10 0 20 40 60 80 100
Nat. Scale 1 : 3,000,000 or 47·34 miles = 1 inch.
Route
Heights in feet.
12°
13°
14°
15°
16°
17°
SOUTH ATLANTIC OCEAN
Lobito B.
Katumbella
BENGUELLA
Mt. Lucinja
Dombe Grande
Elephant B.
Mt. Cangamba
C. Martha
MOSSAMEDES
Mt. Tamo
Killengues
LOBANGO
Sa. da Bandeira
S. Januario
S. Pedro da Rapangombe
Chihia
Chibemba
Mt. Luciano
R. KUNENE
GERMAN SOUT
Projection, Secant Conical
Published by the Royal Geogr

ANGOLA
CUNINGHAME

15°
16°
17°
13°
14°
15°
16°
17°
Mt. Luvundo
Mt. Loviti
7778
Bailundo
Ondulu
Ft. Neves
Ferreira
Chakanga
Cusamba
Silva Porto
(Fort Belmont)
Bihe
Gando
Lumbala
Mavando
Ochingolya
Pomba
Kakonda
5387
Capala
Ft.te da Lucequa
Dongulla
MULONDO
Kitove
Katchiva
Quilau
OMBANDAS
Humbe
Guiva
KWIN HAMAS
KUNENE
R. Kutato
R. Kubango
R. Kuchi
R. Kuando
R. Kuebe
R. Kuvale
R. Kavando
R. Kubango
R. Kuando
R. Kuchi
R. Kuebe
R. Luchazes
R. Kivoli
R. Chitando
R. Kimpollo
R. Chipungo
R. Kuebe
R. Kuvale
R. Kavando
R. Kuando
R. Kuebe
R. Kuchi
R. Luchazes
R. Kivoli
R. Kokema
R. Kuebe
R. Kuando
R. Kuchi
R. Kuebe
R. Kuando
R. Kuebe



First Season's Work.

Track of "Discovery" along Great Ice Barrier and King Edward VII Land, Jan.y and Feb. 1902. _____

Sledge Journeys.

Capt.n Scott, R.N. & Party Nov. 2. 1902 to Feb. 3. 1903.
Lieut. Armitage, R.N.R. & Party Nov. 29. 1902 to Jan. 19. 1903.
Lieut. Barne, R.N. & Party Dec. 20. 1902 to Jan. 30. 1903.
Dr Koettlitz " " Sept. 24. " " Oct. 2. 1902.
" " " " Dec. 29. " " Jan. 8. 1903.
" " " " Jan. 14. 1903 " " 26. "
Lieut. Armitage, R.N.R. & Party Sept. 10 - 24, 1902.
Tracks of Lt. Royds and Parties to Cape Crozier.
March 4-14. Oct. 4-24. Nov. 4-7. 1902.

Second Season's Work.

Capt.n Scott, R.N. and Party, Oct 26. 1903 to Dec. 24. 1903.
Lieut. Armitage, R.N.R. & Party, Nov. 28. 1903. to Dec 12. 1903.
Lieut. Barne, R.N. " " Oct. 6. " " " 13. "
Lieut. Royds, R.N. " " Nov. 10. " " " 10. "
Doctor Wilson, " " Oct. 12. " " Nov. 6. "
Lieut. Royds, R.N. " " to Cape Crozier Sept. 7 to 17. 1903.

The small circles marked on tracks denote positions fixed by Observations
Magnetic Variations marked thus 170 &c.
Soundings in fathoms. . Heights in feet along Ice Barrier are above sea level
Land heights above Barrier Surface.

Projection, Secant Conical.

Sh

THE NATIONAL

LIEUT. GEO

Nat. Scale

Published by the Royal Geographical Soc

MAP

Showing the Work of

...NAL ANTARCTIC EXPEDITION.

1902-3-4.

From a drawing by

...T. GEORGE F. A. MULOCK, R.N.

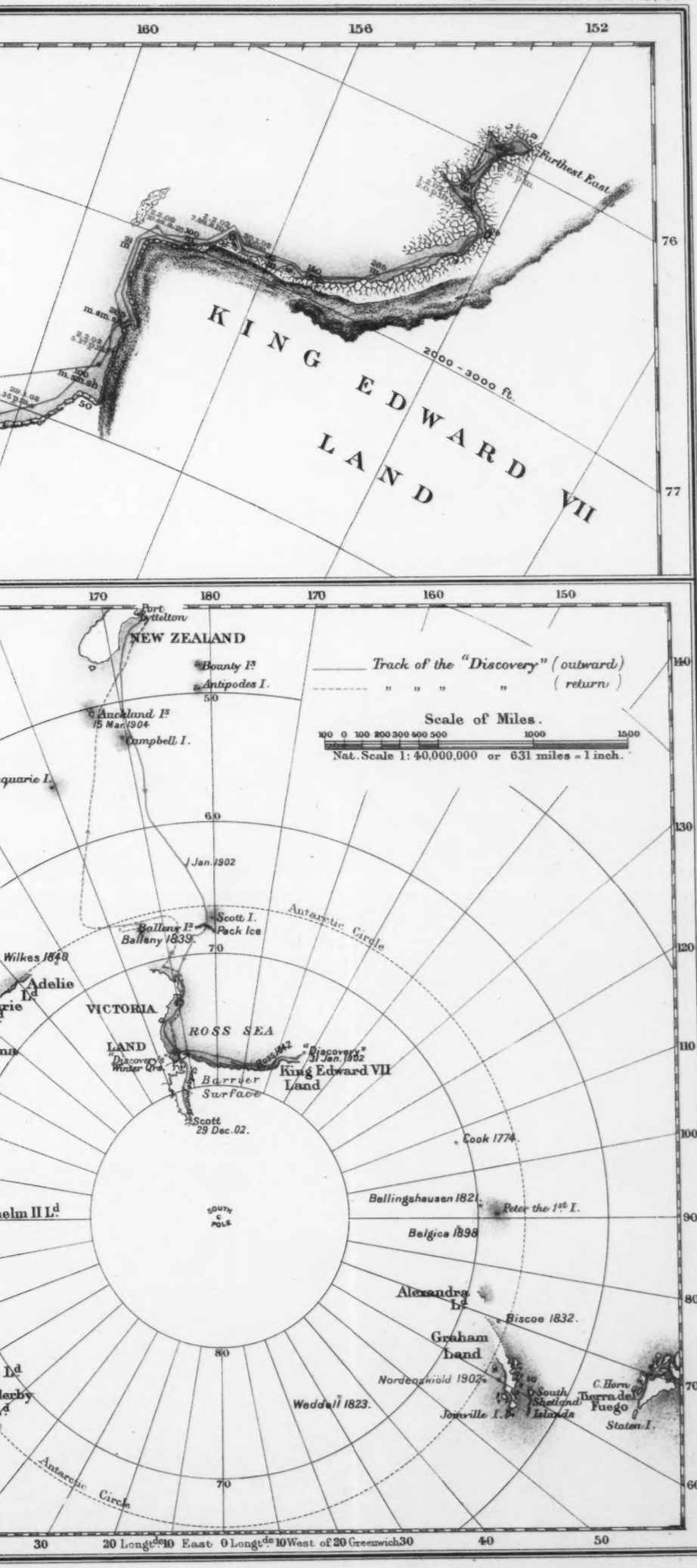
Scale of Miles.

0 10 20 30 40 50 100

...lat. Scale 1: 2,500,000 or 39·45 miles = 1 inch.

...ong. 176 West 172 168 164 160 156

...graphical Society.


160
156
152
Furthest East
76
KING EDWARD VII LAND
2000 - 3000 ft.
77
170
180
170
160
150
Port Lyttelton
NEW ZEALAND
Bounty Is
Antipodes I.
Auckland Is
15 Mar. 1904
Campbell I.
Track of the "Discovery" (outward)
" " " " (return)
Scale of Miles.
100 0 100 200 300 400 500 1000 1500
Nat. Scale 1: 40,000,000 or 631 miles = 1 inch.
110
60
130
1 Jan. 1902
Scott I.
Pack Ice
Balleny Is
Balleny 1839.
Antarctic Circle
70
120
Wilkes 1840
Adelie Ld
VICTORIA LAND
ROSS SEA
Ross 1842
"Discovery" 31 Jan. 1902
King Edward VII Land
Discovery's Winter Qrs.
Barrier Surface
Scott 29 Dec. 02.
110
Cook 1774.
Ballingshausen 1821.
Peter the 1st I.
SOUTH POLE
Belgica 1898
90
Alexandra Ld
Biscoe 1832.
80
Graham Land
Nordenskiold 1902.
C. Horn
Terra del Fuego
South Shetland Islands
Joinville I.
Weddell 1823.
Staten I.
70
Antarctic Circle
60
30
20 Longde 10 East 0 Longde 10 West of 20 Greenwich 30
40
50